THE

AMERICAN GAS-LIGHT JOURNAL.

THE OFFICIAL GAZETTE OF

LIGHT, HEAT, WATER-SUPPLY, AND SEWERAGE.

Rooms—No. 39 Nassau Street, cor. Liberty Street, opposite the Post-Office, New York.

LONDON:—TRUBNER & CO., No. 60 PATERNOSTER ROW.

VOL. III.—No. 57. NEW-YORK, THURSDAY, MAY 1, 1862. $3 PER ANNUM.

HERRING'S PATENT

Champion Fire-Proof Safes.

Herring's Champion Burglar-Proof Safes, with Herring & Floyd's New Patent Crystalized Iron, the only metal which cannot be drilled.

Nearly 25,000 Herring's Safes have been made and sold, and over 500 have passed triumphantly through accidental Fires, thus fully sustaining their acknowledged and well-earned character as the "best Fire-Proof Safes the world ever saw."

Herring's New Patent Burglar-Proof Safes, made of a combination of Wrought Iron, Patent Crystalized Iron, and Bars of Steel, are confidently offered to the public as the strongest and best security against skilful burglars now extant.

It was a "Herring's Burglar-Proof Safe," the public will remember, which so lately held secure its trust against the determined ingenuity of the boldest and greatest mechanical burglars this country has ever known, and saved for the New York Exchange Bank no less than

HALF A MILLION OF DOLLARS.

Herring's Patent Fire and Burglar-Proof Safes *combined*, (one Safe within another,) making the most perfect protection from fire and thieves now known.

FIVE OF HERRING'S SAFES VICTORIOUS!

WELLSBORO', Penn., December 21, 1861.

Messrs. Herring & Co., New York:

Gentlemen,—At the great fire which occurred here on the 18th December last, my store, with a number of other buildings, was entirely destroyed; no less than seven places of business were burnt out and five of your safes severely tested, in every instance saving their entire contents, to the complete and perfect satisfaction of the owners. Two of your Herring's Patent Champion Safes which were in my building remained there through the entire conflagration, and were not opened until the day after the fire. No water was thrown on the building. Everything in my safe after the fire was nearly as good as new. C. L. Wilcox also preserved all his books, papers, and money in two of your safes, both being in same fire. Wm. Roberts was also the fortunate owner of another of your Patent Champion Safes, which was severely tested, and saved completely his books, papers, and money. The result has given great satisfaction, and we want no safe but Herring's Champion. Please send me one same size I last bought of you immediately. Send by N. Y. & Erie R.R. via Tioga depot. JOHN R. BOWEN.

I had two of Herring's Safes in above fire. They saved my books, papers, and $2,000 *in bank bills*. C. L. WILCOX.

HERRING'S PATENT CHAMPION saved my books, papers, and about $400 in *paper money*. I would use no other. WILLIAM ROBERTS.

GREAT FIRE IN PEARL AND FULTON STS.

NEW YORK, Jan. 27, 1862.

Messrs. HERRING & Co., No. 251 Broadway:

Gentlemen,—The large HERRING'S PATENT CHAMPION SAFE you made for me a few years ago has been put to a severe test in the great fire corner Fulton and Pearl sts., on the 26th inst., which entirely destroyed my building, together with many others.

The fire commenced about 6 o'clock on Sunday morning, and the safe was taken from the ruins after an exposure of more than thirty hours.

Your Safe contained all my books, insurance policies, and other valuable papers besides, gold and silver, bank bills, coupon bonds, &c., amounting to over Two Hundred Thousand Dollars. Everything in the Safe is in perfect order, except the binding of the books being steamed.

Your Patent Champion Safe gives us great satisfaction, and has guarded safely through the fire every dollar of its contents.

Truly yours, A. S. FOSTER.

GREAT FIRE IN NEW JERSEY.

NEW BRUNSWICK, N. J., January 18th, 1862.

Messrs. HERRING & Co.,

No. 251 Broadway, New York:

Gentlemen,—At the recent extensive fire in our city, on Wednesday morning last, 15th inst., I was the fortunate owner of one of your HERRING'S PATENT CHAMPION SAFES, which contained some books and a number of valuable papers.

The heat in my store was very great, and the safe subject to an intense heat. I felt great interest in the safety of my papers, as a number of castings in my store and within a few feet of the safe were melted. Nothing, indeed, was saved in my building, except the contents of your safe, which I am happy to inform you was completely preserved, after a thorough roasting for some seventeen hours. The result has exceeded my anticipations, and fully confirmed my confidence in the security of your Herring's Patent Safe. Please send me another of larger size, and refer all incredulous to my books and papers, which it gives me great pleasure to show.

WM. H. ARMSTRONG.

Herring & Co., 251 Broadway.
Farrel, Herring & Co., Phila.
Herring & Co., Chicago.

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BERGEN IRON WORKS, Established 1833.

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MERRICK & SONS, Engineers, Manufacturers of every description of Gas Machinery.

Retorts, Bench Castings, Condensers, Washers, Scrubbers, Wet or Dry Lime Purifiers, Coke Wagons, Fire Tools, Wrought Iron Grate Bars, Gasholders, either TELESCOPIC OR SINGLE, WITH SUSPENSION FRAMES COMPLETE; Wrought Iron Roof Frames, for Iron or Slate; Stop Cocks, Exhausters, Steam Pumps, Boilers and Tanks, Steam or Hand Air Pumps for proving Street Mains, Centre Seals, Governors, Wrought or Cast-Iron Lime Sieves for Purifiers, Purifier Hoisting Machines, &c., &c.

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HERRING & FLOYD, proprietors, manufacture Gas Compensators of all sizes, Self-Acting Valves, Exhausters upon an improved plan, costing less than half those of English manufacture, also castings of every description for Gas and Water Works.

Herring & Floyd offer for sale Sabbaton's Patent Screening Shovels for coke and coals, made of malleable iron, of all sizes; Sabbaton's Patent Improved Cast Iron Furnace Frame and Door, arranged to protect the iron work of the door and frame from direct contact with the fire; also, Floyd's Patent Malleable Iron Retort Covers, only quarter of an inch thick, but of convex form, and of great strength, as is attested by certificates from several of the leading Gas-works in America. For engravings of all the above patents see AMERICAN GAS-LIGHT JOURNAL for October, 1859, pages 65 and 71.

Samples of the above castings can be seen at the Rooms of the AMERICAN GAS-LIGHT JOURNAL.

S. FULTON & CO., (Successors to Colwell & Co.) Manufacturers of Pig Iron and Cast Iron Gas and Water Pipes, also Heavy and Light Castings of every description, No. 207 North Water street and 206 North Wharves, Philadelphia.

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CAST IRON STREET MAINS; *Bends, Branches, Chemical Retorts, and all kinds of Castings for* GAS-WORKS, either COAL or ROSIN WORKS. SHEET IRON FOR GASOMETERS *cut and punched to order*. BOILER IRON *of all descriptions*. RUSSIA SHEET IRON, TIN PLATES, BLOCK TIN, COPPER, PIG LEAD, SPELTER, and Metals generally.

FLORENCE IRON WORKS.—The subscriber is prepared to execute orders and make contracts for Cast-Iron Water and Gas-Pipes, from 2 inches to 48 inches in diameter; also, Retorts, Bench-Castings, Branches, Bends, and all Castings for Water or Gas-Works. Pipes and Castings coated with Smith's Patent Coal Tar Varnish to prevent corrosion.

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205½ Walnut Street, Philadelphia.

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MANUFACTURERS OF
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Office, 400 Chestnut Street,
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TO GAS AND WATER COMPANIES:

The undersigned, Agent for Messrs. Thomas Edington & Sons, Phenix Foundry, Glasgow, Scotland, is prepared to contract for all descriptions of Cast-Iron Pipes of their manufacture.

About 6,000 tons of these Pipes have lately been supplied to the Brooklyn Water-works, N. Y., and the Chief Engineer of the Works, A. P. Kirkwood, Esq., is ready to testify to their excellent quality.

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Sole Agent for the United States and Canada.

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[ESTABLISHED 1821.]

PHILADELPHIA, manufacture Wrought Iron Welded Tubes for Gas, Steam or Water; Lap-Welded Boiler Flues,

GALVANIZED WROUGHT IRON TUBES,

ARTESIAN WELL PIPES,

of Wrought or Cast-Iron, screwed together, flush inside and out; Gas-works Castings, Retorts and Bench Castings for Coal Gas-works,; Cast-Iron Street Mains, Bends, Branches, Drips, &c.

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S. S. ASHCRAFT, CINCINNATI, O., Manufacturer of Gas and Water-Pipes, with Branches of every description; Retorts for Gas and Oil Works; Gasholder Stands, Columns, &c.; Gas Purifiers, Condensers, and Gas Apparatus of all kinds; Foundry Work in general.

N. B.—A complete selection of Patterns on hand. Refer to any of the Gas-Works in the Western and Southwestern States.

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JOHN JEFFREY, Civil Engineer, Cincinnati.
JACOB HOUGHTON, Engineer, Detroit.

WARREN FOUNDRY AND MACHINE CO., Phillipsburg, N. J. Manufacturers of Cast-Iron Pipes, from 2 to 48 inch diameter, all pipes from 3 inch to 48 inch cast vertically, and in dry sand, in lengths of 12 feet. 2 inch pipes in lengths of 7 feet. Special Castings of all descriptions furnished at short notice.

REFERENCES.

Croton Aqueduct dept., N. Y.
Manhattan Gas Lt. Co., N. Y.
Brooklyn Water dept., N. Y.
Brooklyn Gas Lt. Co., N. Y.
Citizens' Gas Lt. Co., Brooklyn, N. Y.

CAST IRON PIPES.—EARL'S IRON WORKS, NEWARK, N. J., 91, 93, 95, 97 and 99 Chestnut Street. Branch Office, 21 Centre street, New York.

The subscriber continues to manufacture Superior Cast-Iron Gas and Water Pipes, Branches, Bends, Angles, Bevel Hubs, Reduces, Sleeves, Drip Syphons, Plugs, Caps, Retorts, Bench Castings, and Castings in general. Particular attention paid to all Castings connected with Gas-Works. E. B. EARL.

PORTABLE GAS-WORKS.

STRATTON & BROTHER'S PATENT GAS-WORKS, for making Gas from ROSIN or COAL OILS. STRATTON'S Patent Double Retort, for Coal, Wood, or Rosin.

Our Patent Gas Works have been put up in some forty Country Residences, Factories, Churches, &c., in which an experience of *ten years* gives entire satisfaction.

Water Works also put up in country residences. All work warranted.

Reference—Prof. JAS. C. BOOTH, U.S. Mint, Phila.
CHRISTOPHER FALLON, "
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FOR

Dwellings, Churches, Country Villages,

As well as for Consumers in Large Cities.

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FOR LIGHTING RAILROAD CARS AND STEAMBOATS WITH GAS.

The whole process of Filling the Gas-Holders of a Railway Train, requires but Three Minutes.

Apply to
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THE LUTHER ATWOOD OIL COMPANY'S

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ILLUMINATING OIL,

Unsurpassed by any KEROSENE manufactured. Is nearly COLORLESS, of a PLEASANT ODOR, and burns without smoke, or crusting the wick.

WARRANTED NON-EXPLOSIVE.

For sale in any quantity at a greatly reduced price.

Packed in cans and cases for foreign markets. Apply to U. TALLMAN,
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COAL OIL! COAL OIL!! of the celebrated brand of "SILVER SPRING." A superior burning oil, white, pure, safe, and odorless.

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A LAMP CHIMNEY THAT WILL not break.—Made for the million.

The patent Mica Chimneys for coal-oil Lamps possess many advantages over the glass chimneys. They do not break from the heat, falling, cleaning, or any ordinary usage. When one is purchased it will last, with care, as long as the lamp. They fit all the burners now in use.

AMOS HORNING,
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No. 321 North Second st., Philadelphia.

N. B.—Coal-Oil Lamps and Coal-Oil at low rates.

PATENTED OCT. 8, 1861.

Dithridge's Patent

OVAL LAMP CHIMNIES,

for Coal-Oil burners. Manufactured of

XX FLINT GLASS.

These chimnies are intended for the flat flame which, heating all parts of the glass equally, does not expose it to cracking.

E. D. DITHRIDGE,
Fort PittGlass Works,
Pittsburg, Pa.

THE LOVERS' LAMPS.—Price Five Shillings ($1.25) each. To supersede Candles and Night Lights. No Dressing or Trimming required.

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Patentee,
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Post-Office orders attended to.

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COAL-OIL,
NO-CHIMNEY
BURNER,

For Portable LAMPS, LANTERNS, Etc. Requires no Chimney.

Address,
J. E. AMBROSE,
249 Pearl st., New York, or
45 Newark Av., Jersey City, N. J.

COAL OIL, FOR BURNING.—FINE quality, 40 to 50 cents per gallon, according to quantities. Dealers and consumers can obtain it at the above rates of XAVIER GEX, coal-oil refiner, 75 William street.

AGENTS.—TO ALL WHO USE Candles.—The Candle Lamp just out. Safety and economy in light. No excuse for using explosive fluids. No dropping of tallow on carpets. The Candle Lamp will be sent free on receipt of 25 cents. Agents, male and female, can make a larger profit, and find a quicker sale for the Candle Lamp, than any article yet offered to the public. Send red stamp for illustrated circular.

WM. SUMNER, 208 Broadway, (room No. 10,) N. Y. city.

PATENT BITUMINIZED PIPES,

For the Conveyance of Water, Gas, and Drainage.

This important invention, patented by Mr. Charles Newbold, and now for the first time introduced to the public, may confidently be stated to be one of the greatest interest and commercial value, as the Patent Bituminized Pipes possess all the qualities necessary for the conveyance of Water, Gas, Sewage, Mine-Pumps, &c., viz.; great strength, great durability, and inoxidability, with the immense advantage of being about *one fifth* the weight of iron pipes, and about 35 per cent. cheaper; whilst, compared with lead pipes, the Bituminized Pipes are only about *one fourth* their price, without the possibility of the formation of the oxide and carbonate of lead, so dangerous for every purpose. They will stand 150 degrees of Heat, and after many trials it has been satisfactorily proved that rats or vermin will not touch them. They also withstand the action of all acids and salts.

Iron pipes are at present frequently covered with a coating of bitumen or coal tar before they are laid down; but the adherence of this coating to the metal being very imperfect, on account of vibration and the difference of expansion, this preservation is insufficient, besides being exposed to a number of influences which neutralize its efficacy—galvanic currents materially assist the formation of oxides and deposits, which cause the obstruction and eventually the destruction of metallic pipes.

The Patent Bituminized Pipes are neutral, non-conductors of electricity, and consequently are not exposed to any of the deteriorating influences mentioned above. The process of manufacture of these Pipes consist in causing a roll of paper to pass through a reservoir of melted bitumen, after which it is tightly coiled around a mandril to any required thickness; and thus, when hardened, a tube is formed of perfect texture, great hardness, and enormous strength. These Pipes are proved, by hydraulic pressure, to resist a pressure of 220 lbs. to the square inch, equal to 506 feet head of water, which is more than double the altitude of the highest reservoir. The bituminous composition which unites and covers these Pipes is so well known as an excellent preservative, that it will be unnecessary to demonstrate that, when laid underground, the durability of the Patent Bituminized Pipes may be considered as unlimited. The Pipes are made in lengths of seven feet, and are connected by socket joints of the same material as the Pipes; or they can be fitted with iron flanged sockets, screwed together in a most simple and inexpensive manner.

For Gas these Pipes are invaluable; the Gas-lining which we insert effectualy resists the action of Gas, and being non-conductors, there can be no condensation in them, and the joints made with the Patent Cement are so strong as to entirely prevent Leakage.

The cost of laying the Pipe is also small, compared with those of iron, and can be done by mere laborers. The Bituminized Pipes have been in use the last three years, for the conveyance of gas and have been ascertained to be as perfect now as when first laid down.

DIRECTIONS FOR JOINING THE PATENT BITUMINIZED PIPES.

Pack the pipes level in the ordinary way; slip the collar over one of the pipes; draw the ends close together and warm them by putting a hot iron between them; then press them together so as to make them adhere; take a piece of iron wire netting, about half an inch in the mesh, a little narrower than the length of the collar, and long enough to wrap once round the pipe, spread the collar over it and the joining; close the ends with clay; pour the melted cement into the manhole of the collar, and fill up the interior space; then remove the clay and the joint is finished.

It is necessary to leave a small vent hole in the clay at each end of the collar to allow the air to escape as the cement is poured in, that there may be no flaws or air bubles in it when cold. If in cooling the cement settles in the manhole, fill up again.

N. B.—The cement should be broken into small pieces and melted in a pot as you do lead, at a low temperature, until it is dissolved; it must be stirred while melting; then take it off and keep stiring it as it cools until it becomes nearly as liquid as water; then pour quickly.

All Orders should be addressed to

THE AMERICAN BITUMINIZED PIPE COMPANY,
OFFICE 24 WATER STREET, BOSTON, MASS.,
J. McGEARY, AGENT;

or to FREDERICK W. BOND,
SOLE AGENT FOR NEW YORK,
58 LIBERTY STREET, (Between Broadway and Nassau Streets,) **NEW YORK.**

Cement for Joining, For Sale as above.

GAS-COAL.

LIVERPOOL AND NEWCASTLE
CANNEL & COAL,
FOR
Gas-Manufacturers and House Use.
The careful shipment of the best qualities, of Cannel and Coal, at the lowest rates current at the time of engagement guaranteed.
T. W. PARMELE, Agt.,
No. 4 Irving Place, New York.

"PEASLEY CROSS" SUPERIOR HOUSE CANNEL.—The undersigned is receiving regular supplies of the above well-known and choice Cannel, selected carefully, for sale, ex ship or from store, in lots to suit purchasers, on reasonable terms.

Dealers can be supplied by lighters, at their yards, from ships Vanguard and New World, now discharging, and from other vessels to arrive.

Apply to RICHARD THACKRAY,
No. 44 Exchange Place.

F. BUTTS & CO. (Successors to BUTTS & KENDALL),
DEALERS IN THE CELEBRATED
Sterling Coal
Pittsburgh and other Gas Coals,
P. O. DRAWER, 74,
CLEVELAND, OHIO.

ANTI-FREEZING APPARATUS.

FREEZING OF GAS-PIPES.—Walton's Patent Anti-Freezing Apparatus illustrated by Engravings in the AMERICAN GAS-LIGHT JOURNAL, of Jan. 1, 1861, page 212, is the most simple, durable and efficient of any known process.

See also certificates from Cincinnati, O., and Louisville, Ky. Gas-Works in same number, page

Address, JOHN WALTON,
Sup't Gas-Works, Louisville, Ky

GAS-METER FLUID.

FLUID FOR GAS-METERS.—The undersigned is prepared to furnish the Glycerine Meter Fluid in quantities to suit purchasers. *It does not evaporate, can be made to stand any degree of cold liable to occur in this country or in Canada, and does not corrode the metals of the meter. It has been in use successfully for the last three years.*

For particulars, references, &c., address the manufacturer, HENRY BOWER,
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First block above City Gas-Works,
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Manufacturers of
STATION METERS,
WET & DRY CONSUMERS' METERS,
EXPERIMENTAL METERS,
GLAZED METERS,
PRESSURE REGISTERS,
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PHOTOMETERS,
MINUTE CLOCKS,
WATCHMEN'S CLOCKS, &c., &c., &c.

H. R. WORTHINGTON'S PATENT Water-Meter.—This Meter combines accuracy, simplicity and remarkable durability, with such ease and certainty of motion, as to offer no appreciable obstructions to the flow of water in the pipes to which it is connected, as it runs and registers upon three inches head, or when delivering the smallest stream. These qualities, with its low cost, have caused its extensive adoption by corporations and individuals, in many of our largest cities.

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STATION, SHOW, & EXPERIMENTAL METERS,
Photometers, Pressure Registers, Indicators, and Gages, Governors, Meter Provers, Centre Seals, Fluid Gages, &c.
GAS APPARATUS
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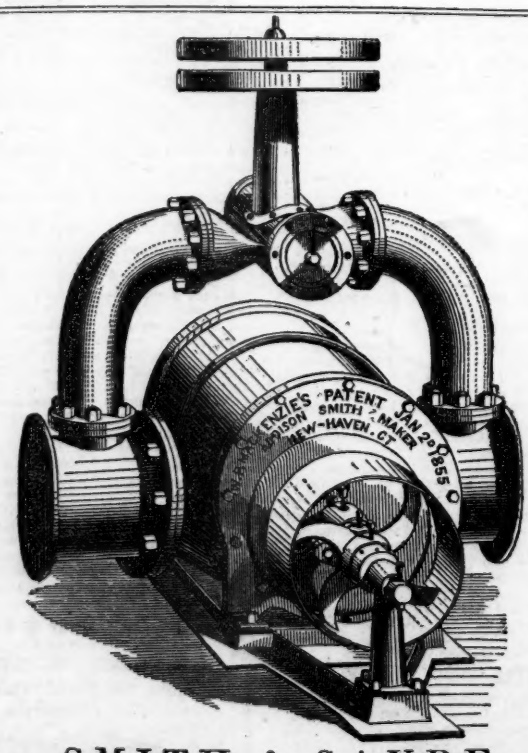

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THE MACKENZIE PATENT GAS EXHAUSTER
AND
PATENT COMPENSATOR.

They are made to pass from 4,000 to 150,000 cubic feet of gas per hour; will increase the production and illuminating power of the gas, and add very much to the durability of the retorts, either clay or iron. The Compensator obviates entirely the necessity of water-joints, is compact, durable, cleanly, not liable to get out of order, self-acting, quiet, and certain in its operation.

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MACKENZIE PATENT BLOWER, PATENT CUPOLA AND SMELTING FURNACE.

The Blower is a Force Blast machine, durably built, and can be driven with one-third the power required to drive the ordinary Fan. The Cupolas are manufactured in sizes to melt from 1 ton to 20 tons per hour, will save one quarter of the time required by the old style Cupola, and 33 per cent. fuel. Address SMITH & SAYRE, 458 Broadway, New York.

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We are now publishing regularly the names of the thirty thousand post-towns in the United States, so that builders of gas-works and water-works, and the various manufacturers, may see where are new openings for business. And as each post-master will receive several copies of the AMERICAN GAS-LIGHT JOURNAL, for distribution, the number thus circulated will probably exceed *Three Million Copies. What a chance for advertisers!*

POST-OFFICE TOWNS IN THE UNITED STATES,

ARRANGED BY STATES AND COUNTIES,

Showing where Gas-Works and Water-Works are Wanted.

PENNSYLVANIA.

65 Counties, 2,364 Towns, 51 Gas-Works, 15 Water-Works.

(*Continued from page 307.*)

Delaware County—*Continued.*

Ivy Mills, Kellysville, Leipersville, Lenni Mills, Lima, Marple, Media, Newtown Square, Oakdale, Radnor, Ridleyville, Rose Tree, Spread Eagle, Thurlow, Upper Darby, Village Green, West Haverford.

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Erie County.

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Fayette County.

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Forest County.

Clarington, Foxburgh, Marionville.

Franklin County.

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Burnt Cabins, Fort Littleton, Harrisonville, McConnellsburgh, New Grenada, Spearsville, Warfordsburgh, Webster's Mills, West Dublin.

Greene County.

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Huntingdon County.

Airy Dale, Alexandria, Aughwick's Mills, Barre Forge, Birmingham, Broad Top, Calvin, Cassville, Coalmont, Coffee Run, Colerain Forge, Cottage, Crownover's Mills, Cumminsville, Donation, Eagle Foundry, East Barre, Ennisville, Graysville, Greenwood Furnace, *Huntingdon*, (c. h.,) James' Creek, McAlevy's Fort, McConnellstown, Maddensville, Manor Hill, Mapleton Depot, Meadow Gap, Mill Creek, Monroe Furnace, Mount Union, Orbisonia, Paradise Furnace, Shade Gap, Shaver's Creek, Shirleysburgh, Spruce Creek, Three Springs, Todd, Vineyard Mills, Warrior's Mark, Water Street, West Barre.

Indiana County.

Armagh, Ayers, Black Lick, Black Lick Station, Blairsville, Brady, Brush Valley, Chambersville, Clarksburgh, Coal Port, Cookport, Decker's Point, Delhi, Ebenezer, Elder's Ridge, Hillsdale, Horton's, *Indiana*, (c. h.,) Kent, Mahoning, Marchand, Mitchell's Mills, Newman's Mills, Penn Run, Philip's Mill, Plumville, Saltsburgh, Shelocta, Smicksburgh, Smitten, Strongstown, Tannery, Tunnel, Utah, West Lebanon, Willet.

Jefferson County.

Alvan, Big Run, Brockwayville, *Brookville*, (c. h.,) Brown's Mills, Cool Spring, Corsica, Frostburgh, Hamilton, Packer, Porter, Punxsutawney, Reynoldsville, Richardsville, Ringgold, Schoffner's Corners, Sprankle's Mills, Summersville, Warsaw.

Juniata County.

Academia, East Salem, East Waterford, Evendale, Honey Grove, McAllisterville, McCoysville, McCulloch's Mills, Mexico, *Mifflintown*, (c. h.,) Mohontongo, Oakland Mills, Patterson, Peru Mills, Pleasant View, Port Royal, Richfield, Spruce Hill, Thompsontown, Walnut, Waterloo.

Lancaster County.

Adamstown, Bainbridge, Bareville, Bart, Bartville, Beartown, Bellemonte, Bethesda, Binkley's Bridge, Blue Ball, Bowmansville, Brickerville, Brinkley's Bridge, Buck, Cain's, Camargo, Cambridge, Chesnut Level, Chickies, Christiana, Churchtown, Clonmell, Cocalico, Colemanville, Colerain, Columbia, Conestoga, Durlach, East Hempfield, Elizabethtown, Enterprise, Ephratah, Falmouth, Farmersville, Fertility, Fulton House, Gap, Goodville, Gordonsville, Greene, Greenland, Groff's Store, Hempfield, Highville, Hinkleton, Intercourse, Kinzers, Kirk's Mills, Kirkwood, Lampeter, *Lancaster*, (c. h.,) Landis Valley, Landisville, Leacock, Liberty Square, Litiz, Lyles, Manheim, Manor, Marietta, Martickville, Martinsville, Mastersonville, May, Maytown, Mechanic's Grove, Millersville, Mount Hope, Mount Joy, Mount Nebo, Mountville, Muddy Creek, Neffsville, New Danville, New Holland, New Milltown, New Providence, Nine Points, Oak Hill, Oak Shade, Octoraro, Old Line, Oregon, Paradise, Penn, Peter's Creek, Piquea, Pleasant Grove, Puseyville, Quarryville, Rawlinsville, Reamstown, Reinholdsville, Rothsville, Safe Harbor, Salisbury, Schoeneck, Silver Spring, Slack Water, Smithville, Smyrna, Soudersburgh, South Hermitage, Sporting Hill, Strasburgh, Swarr's Mills, Swartzville, Terre Hill, Voganusville, Wakefield, West Earl, Wheatland Mills, Willow Street, Weaver's Mills, White Oak.

Lawrence County.

Chenango, Cross Cut, Eastbrook, Edinburgh, Enon Valley, Harlensburgh, Hillsville, Irish Ripple, Marr, Marvin, Mount Jackson, Neshannock Falls, New Bedford, *Newcastle*, (c. h.,) New Wilmington, Plain Grove, Princeton, Pulaski, Rose Point, Volant, Wurtemberg.

Lebanon County.

Achey's Corner, Annville, Bellview, Campbelltown, Colebrook, Cornwall, East Hanover, Fredericksburgh, Heilman's Dale, Jonestown, *Lebanon*, (c. h.,) Meyerstown, Millbach, Missemer Mills, Mount Zion, Ono, Palmyra, Richland Station, Shaefferstown, Union Forge.

Lehigh County.

Allentown, (c. h.,) Breinigsville, Catasauqua, Centre Valley, Claussville, Coopersburgh, Dillingersville, Emaus, Fogelsville, Friedensville, Germansville, Hensingersville, Hosensack, Jacksonville, Laury's Station, Lehigh Valley, Low Hill, Lynnville, Lyon Valley, Macungie, New Tripoli, North Whitehall, Orefield, Rittersville, Rucksville, Ruppsville, Saucon Valley, Schnecksville, Seiberlingville, Shimerville, Shoenersville, Slatington, South Whitehall, Stinesville, Trexlertown, Weisenburgh, Wescosville, Whitehall Station.

Luzerne County.

Albert's, Archbald, Bailey Hollow, Bald Mount, Beach Haven, Bear Creek, Blakeley, Black Creek, Cambra, Campbell, Carbondale, Carverton, Clark's Green, Clifton, Conyngham, Daleville, Dallas, Dorrance, Drum's, Dunmore, Dunnings, Eckley, Exeter, Fair Mount Springs, Fleetville, Forty Fort, Gouldsboro', Green Grove, Harveyville, Hazleton, Hendricksburgh, Hobbie, Humphreysville, Hunlock Creek, Huntsville, Hyde Park, Jeansville, Kingston, Kunckle, Lackawana, Lake, Lehman, Milwaukie, Moosic, Morrison, Moscow, Muhlenburgh, Nanticock, Nescopeck, New Columbus, Old Forge, Orange, Pencader, Pittston, Plainsville, Plymouth, Port Blanchard, Providence, Ransom, Red Rock, Scranton, Shickshinney, Sloyersville, Stockton, Stoddardsville, Sweet Valley, Sybertsville, Town Hill, Town Line, Trucksville, Wallsville, Wapwallopen, Waverly, West Nanticoke, White Haven, *Wilkesbarre*, (c. h.,) Wyoming.

Lycoming County.

Alvira, Barbour's Mills, Bastross, Bodine, Cedar Run, Chesnut Grove, Clinton Mills, Cogan House, Corson's, Elimsport, English Centre, Haneyville, Hiner's Run, Hughesville, Huntersville, Jersey Mills, Jersey Shore, Lairdsville, Larry's Creek, Linden, Loyalsock, Lycoming Creek, Montouresville, Moreland, Muncy, Newberry, Nippenose, Oval, Phelps' Mills, Ralston, Road Hall, Salladyburgh, Texas, Tomb's Run, Trout Run, Unityville, Warrensville, Waterville, White Deer, White Pine, *Williamsport*, (c. h.,) Wolf Run.

McKean County.

Alleghany Bridge, Annin Creek, Bradford, Burtville, Clermontville, Eden, Farmer's Valley, Glenn, Kendall Creek, La Fayette, Norwich, Port Alleghany, Prentiss Vale, Startwell, Shippen, *Smithport*, (c. h.)

Mercer County.

Balm, Centretown, Clark, Delaware Grove, French Creek, Jamestown, Leesburgh, London, Maysville, *Mercer*, (c. h.,) Salem, Sandy Lake, Satterfield, Sharon, Sheakleyville, Harthegig, Henderson, Hermitage, Hill, Indian Run, Irishtown, Milledgeville, New Hamburgh, New Lebanon, New Vernon, North Liberty, North's Mill, Perrine, West Greenville, West Middlesex, West Salem, Worth, Wilow Brook, Wolf Creek.

Mifflin County.

Allensville, Atkinson's Mills, Belleville, Decatur, Kishacoquillas, *Lewistown*, (c. h.,) Locke's Mills, McVeytown, Menno, Milroy, Newton Hamilton, Reedsville, Strode's Mills.

Monroe County.

Analomink, Bartonville, Bossardsville, Brodheadsville, Coolbaugh's Covesville, Delaware Water Gap, Effort, Experiment, Fennersville, Henrysville, Kellersville, Kresgeville, Kunkletown, Long Valley, Marshall's Creek, Merwinsburgh, Naglesville, New Mount Pleasant, Paradise Valley, Poponoming, Priceburgh, Rossland, Shawnee, Shoemaker's, Snydersville, Spruce Grove, Stormville, *Stroudsburgh*, (c. h.,) Tannersville, Treibleville, White's Tannery.

Montgomery County.

Abington, Barren Hill, Blue Bell, Bridgeport, Broad Axe, Cabinet, Centre Square, Cheltenham, Conshohocken, Crooked Hill, Douglass, Eagleville, Fagleysville, Fairview Village, Fitzwatertown, Franconia, Frederick, General Wayne, Gilbertsville, Gulf Mills, Gwynedd, Harleysville, Hatboro', Hickorytown, Hillegass, Hoppenville Horsham, Huntingdon Valley, Jeffersonville, Jenkintown, King of Prussia, Kulpsville, Lederachsville, Limerick, Limerick Bridge, Line Lexington, Lower Merion, Montgomeryville, New Hanover, *Norristown*, (c. h.,) Norritonville, Pennsburgh, Penn's Square, Perkiomen Bridge, Perkiomenville, Pleasant Run, Plymouth Meeting, Port Kennedy, Port Providence, Pottstown, Prospectville, Red Hill, Royer's Ford, Salfordville, Schwenck's Store, Shannonville, Shoemakertown, Skippack, Sorrell Horse, Spring House, Sumneytown, Three Tons, Trappe, Tyler's Port, Union Square, Upper Dublin, White Marsh, Willow Grove, Worcester, Zeigiersville.

Montour County.

Danville, (c. h.,) Exchange, Limestoneville, Mooresburgh, Roaring Creek, Washingtonville, White Hall.

Northampton County.

Bath, Belfast, Berlinsville, Bethlehem, Blue Mountains, Boston, Bush Kiln Centre, Butztown, Cherryville, Danielsville, Dill's Ferry, *Easton*, (c. h.,) Flicksville, Freemansburgh, Hanoverville, Hecktown, Hellertown, Iron Hill, Kessler's, Klecknersville, Kreidersville, Laubach, Leithsville, Lower Saucon, Martin's Creek, Middagh's Moorestown, Mount Bethel, Nazareth, Newhart's, Petersville, Richmond, Seidersville, Slateford, South Easton, Stockertown, Stone Church, Uhlerstown, Weaversville, Wind Gap.

Northumberland County.

Augusta, Bear Gap, Chillisquaque, Chulasky, Dalmatia, Dewart, Elysburgh, Fisher's Ferry, Greenbryer, Herndon, Hickory Corners, Kline's Grove, Line Mountain, McEwensville, Mahanoy, Milton, Mount Carmel, Northumberland, Paxinos, Pott's Grove, Rebucks, Rushtown, Shamokin, Snydertown, *Sunbury*, (c. h.,) Trevorton, Turbotville, Union Corner, Watsontown.

Perry County.

Andersonburgh, Andesville, Blain, Donnally Mills, Duncannon, Elliotsburgh, Ickesburgh, Juniata, Landisburgh, Liverpool, Markiesville, Millerstown, Montgomery's Ferry, Morleytown, New Bloomfield, New Buffalo, New Germantown, Newport, Roseburgh, Sandy Hill, Sherman's Dale, Sterreti's Gap, Warm Springs.

Philadelphia County.

Andora, Blockley, Bridesburgh, Bustleton, Byberry, Chesnut Hill, Falls of Schuylkill, Feltonville, Fox Chase, Frankford, Germantown, Holmesburgh, Kensington, Kingsessing, Leverington, Manayunk, Milestown, Mount Airy, Oxford Church, *Philadelphia*, (c. h.,) Port Richmond, Rising Sun, Somerton, Tacony.

(*To be continued.*)

GAS IN ENGLAND.—Dr Letheby has recently made an examination of the gas supplied to the city of Oxford, the result of which is creditable to the engineer having charge of the works of that city. By the photometer, the mean illuminating power of gas consumed in one evening was equal to 19.33 standard sperm candles of 120 grains consumption to the hour. Respecting the chemical purity of the gas, the doctor says:

The chemical quality of the gas was equally good; for it was found to be entirely free from sulphurtted hydrogen, and contained but a small proportion of ammonia, namely, 5.73 grains per 100 cubic feet.

The total amount of combined sulphur in the gas was only 7.45 grains per 100 cubic feet, whereas that allowed by act of Parliament, in the gas of London is 20 grains per 100 cubic feet.

Taking all these facts into consideration, I am of opinion that the gas supplied to the city of Oxford, as shown by these investigations, is of a remarkable good quality, both in respect of illuminating power and chemical purity.

THE GAS-WORKS OF LONDON.

BY ZERAH COLBURN.

(*From the London Engineer.*)

The metropolis, including a number of its suburbs, is supplied with gas by thirteen companies owning nineteen works, all but two of which are within four miles of Charing cross. The retorts, both single-end and double-end, are equal to almost exactly 5,000 double retorts, averaging about 19 feet in length, or to 10,000 mouth-pieces. It has been estimated that these works carbonize 850,000 tons of coal annually, and from which about 8,000,000,000 (eight thousand million, or, in the ordinary terms of gas measurement, eight million thousand) cubic feet of gas is made. Of this, upwards of one million thousand feet is lost by leaking from the mains and in other ways, while the rest is sold for about £1,600,000. Other estimates give 1,000,000 tons as the amount of coal carbonized yearly, the sale of gas amounting to £2,000,000, equal to 14s. 6d. for every man, woman, and child in the metropolis.

The first gas company in London, as it was the first in the world for the production of gas commercially, was the "Chartered," originally empowered as "*The* Gas-Light and Coke Company," and which commenced business in 1812. This company has, for many years, carried on three separate works, one in the Horseferry road and Great Peter street, Westminster, one in Goswell street and Brick lane, and a third in the Curtain road. The City of London Gas-Light and Coke Company built extensive works, in 1812 also, at the foot of Dorset street, just below the Temple, and upon ground origanally occupied by the New River Company. The Phœnix Company was the first to make gas on the south side of the Thames, their first retort house, at Bankside, and now occupied as a boiler shop by Messrs. Rennie, having been built in 1816. The present retort house at Bankside was erected in 1840, and in 1848 the same company, already carrying on a branch works at Greenwich, established a third and extensive station at the southeastern end of Vauxhall bridge, with large gas-holders at Kennington oval. The next London gas company was the Imperial, whose operations have always been by far the most extensive of any in the metropolis, if not in the kingdom. The Imperial has three gas-works, the Pancras station, at Battle bridge, near King's cross, the Hackney road works, Great Cambridge street, and a third establishment at Fulham. Then we have the London Gas-works, in Vauxhall, near the bridge, the Ratcliff, near the Wapping end of the Thames Tunnel, the South Metropolitan in the Old Kent road, the Commercial in Stepney, near the Mile End road, the Equitable in Pimlico, a short distance above Vauxhall bridge, the Independent in Albert street, Haggerstone, the Surrey Consumers' in Rotherhithe, near the Thames Tunnel, the Great Central Consumers' at Bow Common, and the Western at Kensall Green. It will not be necessary for our purpose to give the boundaries of the districts supplied by the various companies. In most cases the position of the works themselves is within the district supplied, although in other instances the whole delivery of gas is at a considerable distance from the works. Thus, the Great Central Consumers' Company, whose works are at Bow Common, are not allowed by their act to supply gas elsewhere than in the city of London, the neighborhood about their own works being lighted by the Commercial Company.

Three gas-works, the Ratcliff, the Surrey Consumers', and the Greenwich branch of the Phœnix, are on or close to the Thames, below London bridge, and are thus enabled to receive their coal directly from the Newcastle colliers. Five works, the Bankside and Vauxhall stations of the Phœnix Company, the City, the London, and the Equitable, are on the river side, above bridge. Five works, the Commercial, the Independent, the Pancras and Hackney road stations of the Imperial, and the Western, are on the Regent's Canal. The Fulham station of the Imperial Company is on the Kensington Canal, the South Metropolitan Works are on the Grand Surrey Canal, and the Great Central Consumers' is close to the North London Railway, from which branches extend directly into each side of the retort house. Neither of the three stations of the Chartered Gas Company are on a line of water or railway communication, the whole of their coal having to be sacked at the nearest wharf, thence carted to the works, where the men carry it in on their backs. The city extension of the North London Railway will run close to the Curtain road works, which will thus receive their coal directly from the railway wagons, the level of the rails being 16 feet above the floor of the retort house.

Illuminating gas is produced by the decomposition of organic substances, of which coal is among the cheapest and most convenient. Under a destructive distillation at a high heat, wood, resins, fats and oils, peat, and many other substances yield lighting gas. In some of the towns in America, as at Wilmington, North Carolina, the whole supply of gas has been made from pine wood, which does not, however, afford a gas of high illuminating power. Works for the production of gas from resins, fats, and oils were at one time common, but have been generally abandoned on account of the greater cost of the gas produced as compared with that obtained from coal in the ordinary manner. Some interest has been aroused by the gas-producing properties of peat, and one or two of the London companies are now experimenting with peat from the estates of the Earl of Caithness, in the north of Scotland. Thus far the results have been encouraging, and it may be that peat gas will bye and bye come into extensive use.

Purified coal-gas consists almost entirely of carbon and hydrogen in two different proportions of mixture. Hydrogen, which is the more inflammable constituent, gives but a very feeble light when burnt in the air or in pure oxygen. When two atoms of hydrogen have united themselves to one of carbon, forming carburetted hydrogen or marsh gas (the "fire damp" of the miners), light is afforded, as, in burning, the inflammation of the hydrogen precipitates the carbon atoms, raising them to incandescence, in which state they are highly luminous. When the two atoms of hydrogen take up a second atom of carbon, forming bi-carburetted hydrogen, or olefiant gas, the illuminating power is greatly increased. Purified coal-gas is a mixture, in variable proportions, of pure hydrogen and carburetted and bi-carburetted hydrogen, the whole having, as in the average of London gas, a specific gravity of about .400 or .412, air being 1.000.

Coal is, practically, a compound of carbon and hydrogen in the solid state. A good gas coal may contain 85 per cent. of carbon, and from 5 to 7 per cent. of hydrogen, the remainder being fixed oxygen, &c., besides mineral matter. The coal once decomposed at a high heat, the hydrogen immediately takes the gaseous state, carrying with it also from twice to three or four times its own weight of carbon vapor in combination. The remaining carbon, generally from 60 to 70 per cent. of the original weight of the coal, is known as coke, its porus structure being due to the formation of highly expansive gas throughout its whole mass. At a low heat, the chief products of the distillation of gas-bearing coal are liquid hydrocarbons, as oil and tar. Paraffin oil is distilled at a moderate heat from the highly hydrogenous Boghead coal, and it is probable that the vast subtarranean collections of oil in and near the American coal fields have been formed by the action of internal heat upon the beds of coal themselves. At various places not far from the oil wells, natural gas is obtained in abundance from the ground, the town of Fredonia, in the State of New York, being lighted throughout by natural gas, which is also employed for illuminating one of the lighthouses on the southern shore of Lake Erie. This gas, we may suppose, has been generated at a higher heat from either the coal or coal-oil, from near deposits of which the gas is obtained.

We may observe here that the lights given out by torches, oil and spirit lamps, and candles, are true gas-lights, as much so as that which blazes from the burner of a gas-pipe. In burning any inflammable substance, it is gradually decomposed by the heat communicated from the original ignition, and the gaseous products thus formed, and to which the brilliancy of the light is due, are practically identical with coal gas. The superior brilliancy of the latter is due to its being less diffused, and to being burnt at a more rapid rate; at least a dozen sperm candles being required to give as much light as an Argand gas-burner burning 5 cubic feet of hour. A gas-burner burning but 1½ cubic feet per hour gives a light only equal to that of a single candle, while by doubling the discharge from the burner a light equal to that of from 8 to 10 candles is obtained.

With this hasty glance at the nature and properties of coal gas, we may follow up the details of its production in the great gas-works of the metropolis. At many of these works two qualities of gas are made, ordinary gas and cannel gas, the latter having two-thirds more illuminating power than the former, the usual price of ordinary gas being 4s. 6d. per thousand cubic feet, while cannel gas is sold at 6s. The Western Gas Company make only cannel gas. For the ordinary gas the coal used comes from the neighborhood of Newcastle. A good house coal is not, as a rule, the best gas coal, as the latter would be too smoky and "crusty." Hence it is that the coal from the Pelton, Haswell, Lambton's, Levison's, and Pelaw pits, being especially rich in hydrogen, and therefore preferable for gas-making, ranks in price considerably below that of Wallsend. Thus North Pelton gas coal has been quoted lately as low as $2.90, and perhaps $3.43 is a fair average price for gas coal in the Pool, where the Surrey Consumers' Company unship them at their own doors. Cannel gas either is made directly from Lancashire, Scotch, or Welsh cannel coal, or it is made by mixing the gas from Newcastle coal with that made from Boghead coal. The latter now brings $13 60 a ton, and its price is likely to rise to where gas companies can no longer afford to use it. Some of the Newcastle coals contain a certain proportion of cannel in combination. From the Levison coal, for instance, more or less cannel may be picked out. At present, for making cannel gas up to the parliamentary requirement, the proportion of Boghead to Newcastle coal is about as 3 to 7, 30 per cent. of the whole amount of coal carbonized being of the former, and 70 per cent. of the latter variety; the different kinds of coal being carbonized in different retorts, so set that the gases may meet and intermingle in the "hydraulic main" over the retorts.

Good gas coal is more liable than other coals to spontaneous ignition. The presence of "fire-damp" in the mines of richly bituminous coal proves the readiness with which hydrogen separates from solid carbon, and if the coal be reduced to "slack," which is the state in which a great deal of gas coal comes to London, some attention to ventilation is necessary to prevent the accumulation of gas in the vessels and stores in which the coal is kept. Occasionally we hear of a gas explosion, blowing up the decks and "starting" the planking of a collier. If the coal be allowed to get damp, decomposition of both the coal and water goes on, and there is every chance that the former may ignite spontaneously unless thoroughly ventilated. At the different London gas-works, from 20,000 to 100,000 tons of coal are carbonized yearly, and large stocks, often from 5,000 to 20,000 or 30,000 tons of coal are occasionally stored together. Unless care is taken to keep the coal well out of the weather, and to secure good ventilation, both by large openings in the upper part of the walls of the coal sheds, and, generally, by air-pipes penetrating and ramifying throughout the coal itself, there is more or less danger of fire.

The coal wheeled to the floor of the retort-house, the business of gas-making commences. Gas retorts are close vessels, once made almost exclusively of cast iron, but in all the London gas-works they are now almost as exclusively made of fire-clay or built up of fire-bricks. The old iron retorts were generally 9 feet or 10 feet long, with one end cast in, the other being closed by a removable lid or cover. More than nineteen-twentieths however, of all the gas retorts now in use in London are from 18 feet to 20 feet long, and provided with lids at both ends. In cross-section the retorts are either circular, elliptical, or ⏢ shaped, a very large, if not the largest, proportion of those now used in London being of a circular section. An internal diameter of 15 in. is a common size, the fire-clay sides being from 2 in. to 3 in. thick all round. Considerably larger retorts are used, however, the Chartered Company having a number of ⏢ retorts at their Goswell street works, measuring 26 in. inside. The retorts are always placed horizontally, a number varying from five to fourteen being set together within a sort of oven of fire-brick, which is heated throughout, generally by a fire in a single furnace at each end,

although occasionally two fires are employed at each end of a set of retorts. Each set, or oven of retorts, is technically called a "bench," and these are placed, side by side, in a long row, the length of which governs the length of the retort-house.

At the great Pancras station of the Imperial Company, there are nearly 600 retorts, 20 feet long, or nearly 1,200 "mouth-pieces," the retorts being worked from both ends. These are generally set 10 in a bench, although in some of the benches there are but 6 retorts. At the Hackney road station of the same company there are, we believe, 386 retorts 19 feet 6 inches long, a large number being set 10 in a bench. At the Fulham station of the same company are 380 long retorts, 240 of which are set 6 in a bench, while 140 more are set 10 in a bench. It is to be borne in mind that 6 is the number now adopted in setting new retorts.

At the Horseferry road station of the Chartered Gas-Works there are equal to 340 long ⏛ retorts, or 680 mouth-pieces. Some are set 11 in a bench, although a smaller number appears to be preferred. At the Goswell street works, some of the retorts are but 9 feet long, and worked from only one end. There 545 mouth-pieces, equal to 272½ full-length retorts. All are set 5 in a bench. At the Curtain road works only single-end retorts, 9 feet long, are used, and of these there are 155, equal to 77½ retorts 18 feet long.

The Vauxhall station of the Phœnix Company has 357 retorts, 20 feet long, mostly cylindrical, and all set 7 in a bench. At Bankside there are 140 retorts, of the same length and shape, and set 7 in a bench. At Greenwich a similar number is used.

The City of London Gas-Works, Dorset street, have single and double retorts, mostly cylindrical, equal to 940 of the former, or 470 of the latter. There are but few single retorts. A small number also of old retorts are of iron. The usual number placed in a bench is 7, although some are set 5 together.

The London Gas-Works, Vauxhall, have about 250 retorts, mostly cylindrical, 16 inches in diameter, and say 19 feet long. They are usually set 9 in a bench, with one fire grate at each end of each bench, although a number are set 12 in a bench, with two fire grates at each end.

The Equitable Gas-Works have, we believe, 30 benches of long retorts, some with 7 and some with 9 in a bench.

The Commercial Gas-Works have 270 long retorts, set mostly 7 in a bench.

The Ratcliff Gas-Works have 150 long retorts, set 7 in a bench.

The South Metropolitan works have 195 long ⏛ retorts, all but one bench coutaining 7 in a bench.

The Great Central Gas Consumers' works have 279 long retorts, 11 being the number generally set in a bench. The benches are very high, and the retort-house is divided into two stories, 7 retorts opening upon the upper stage and 4 below, where the fire is made. The retorts are all of clay. Originally, Mr. Croll, the former engineer, and afterwards the contractor for carrying on the works, made the fires on a level with the upper stage, where the heat first acted upon 6 clay retorts, afterward descending and acting upon 7 iron retorts below.

The Surry Gas Consumers' works, until lately worked by Mr. Croll, have 16 benches of long elliptical retorts, the retort-house being divided into two stories. The fires are made upon the upper stage, where the fire from each grate acts upon 6 clay retorts 15 inches in diameter, afterwards descending to 8 cast-iron retorts below, there being 14 in a bench.

At the Western Gas-Works there are 165 ⏛ retorts, 20 feet long, set generally 7 in a bench. We may here notice a peculiarity of the retort-house at these works. As originally designed by Mr. G. H. Palmer, it is a 12-sided building, forming a dodecagon in plan. The retorts were originally placed around the building against the sides. When long retorts afterwards came to be used, all the benches were taken down and others set up so as to form ranges radiating from the centre of the house outwardly.

We cannot at this moment give the number of retorts at the Independent Gas-Works.

At the various works of the Chartered Gas Company, and at the South Metropolitan works, the retorts are built on the spot of fire-bricks. At all the other works we believe that retorts moulded in fire-clay are exclusively used, with the exception only of the small number of iron retorts already mentioned. Mr. Grafton, of Cambridge, patented the clay retort in 1820, and it soon after came into extensive use in Scotland; so soon, indeed, that Mr. J. B. Neilson, the patentee of the hot blast, and who was originally engineer to the Glasgow Gas-Works, has had the credit of the first application of clay to gas retorts. It was many years, however, before clay retorts came into extensive use in England. An iron retort 20 feet long, and of medium diameter, weighs about 2 tons, costs, say £12, and is worn out after having distilled about 1,500,000 cubic feet of gas (750,000 feet if the retort be a single one, 9 feet or 10 feet long), which is equal to about on average year's work. A clay retort of the same size, costing 6s. per foot, or £6, will generally be in good condition after three years' use, and some are said to have been worked for from five to eight years. Rather more fuel is required for heating clay retorts than is necessary with iron, but the former can be worked at a higher heat, which gas engineers generally consider an advantage. In America, where the cheapest gas (made at Pittsburgh from coal dug almost at the doors of the works) costs 6s. 3d. per 1,000 feet—the price in New York being 10s. 6d., and in Philadelphia 9s. 6d. per 1,000 feet—clay retorts are only beginning to be used, notwithstanding, too, that the old single-end iron retorts have sold there for nearly £14 a ton.

Fire-clay retorts are made in the neighborhood of Newcastle and elsewhere, and we are not sure that the London gas companies do not import them occasionally from Belgium, where also they are extensively manufactured. A good fire-clay should be, as nearly as possible, pure silica and alumina, combined as a silicate of alumina. The presence of lime and iron, which makes almost the whole of the difference between fire-bricks and ordinary bricks, renders the clay fusible in proportion to the extent to which these impurities are present. The Dynas clay, from Wales, is in high repute among gas engineers, and the Stourbridge and Newcastle fire-clays divide the suffrages of many experienced men. We have even heard Cowan's Newcastle fire-bricks pronounced superior to Stourbridge, notwithstanding that the former cost but about 60s. a thousand, the latter fetching, say 90s., and Dynas bricks somewhere about 110s. Some clays expand under the action of fire, others shrink, and there are others still, among which, we believe, are the three varieties named, whose bulk is hardly affected by any degree of heat.

The fire-clay retorts are moulded about 2½ inches thick, and generally in lengths of from 4 feet to 6 feet. The lengths intended to form the outer ends of the retort are thickened to rather more than 3 inches, and holes are formed in the clay to receive five or six bolts for holding on the mouth-pieces, which are short extensions of the retort, and which are always of cast iron. To fasten the several lengths of the retort, end to end, together, so as to form a single retort, is easily accomplished by introducing at the joints, and in a plastic state, a little fire-clay, as nearly as possible of the same quality as that of which the retort itself is made. With this clay in the joints, precisely as mortar is interposed between ordinary bricks, the retort is "set" or got into place in the "bench," where a high heat is applied, and the separate lengths burnt into one continuous tube, complete and ready for use. Of course all the retorts in a bench, whether there be 5, 7, or a dozen or more, are thus burnt together at the same time. It is usual to make a narrow shallow groove in each abutting end of the several lengths, the fire-clay for jointing thus having a better hold while soft. Many gas engineers, however, now order retorts without this groove, the abutting ends being left as smooth as the other surfaces of the retort.

Clay retorts, unless encircled by frequent thicknesses of brick-work, would crack, and probably break down altogether. We have, it is true, heard something about clay retorts being set and worked in some of the French gas-works, while supported only at the ends, but nothing of the kind is attempted in London. Clay retorts crackle upon the surface, even when, as in all London gas-works, fire-brick partitions or bonds are built completely around them at distances of from a foot to 15 inches from centre to centre for the whole length of the retort. Through these walls, 4 inches thick, and a dozen or fifteen in number, a 20-ft. retort passes much as a boiler-tube might extend through a succession of tube-plates, only there is, perhaps, no necessity for absolutely tight joints in the brick-work outside of gas retorts, at least the brick-work within the walls of the bench in which they are set. We have referred to the bond-walls before commencing to describe the setting of retorts, and for the reason that these walls do not particularly affect the distribution and action of the heat, but are provided chiefly to secure the integrity of the retorts themselves, and may thus be regarded as part of their own structure. Clay retorts, however protected, must be very gradually heated, and as gradually let down, else they will be very apt to crack.

Retorts built up of separate fire-bricks have been used for many years, and Mr. Spinney has made them, in this manner, of the size of large ovens, say 5 feet wide, or thereabouts, at the bottom. Of the fire-brick retorts now made in the London gas-works, few, however, are over 20 inches wide at the bottom. The advocates of fire-brick retorts declare that they will neither crack nor leak. Inasmuch as they cost but little, if any, more than moulded clay retorts, last at least as long, require no more fuel for heating, and involve no especial difficulties or inconveniences, one would suppose that, if they possessed any merits, they would be in general use. These negative virtues are insufficient, however, to commend them to gas engineers generally. We suspect the chief reason to be that, as they must be constructed and burnt together at the gas-works, men who have had no experience with them (and here we include nine-tenths of all gas engineers) are disinclined to incur the care and possible chances of failure of making them, and, therefore, with the retort-maker's commercial travellers omnipresent, prefer buying outright that which is known to answer, and which, if it fail, can be returned to a responsible tradesman who undertakes to make good all defects. For our own part, we are inclined to believe that the brick retorts are the cheapest in the end; but it is, perhaps, too much to expect men to enter upon a business in which there is nothing to protect them from themselves, whereas, by giving out a contract, they can transfer the whole responsibility to other shoulders, whose owner is glad enough—for the sake of profit—to take all the risk.

At the Horseferry road station of the Chartered Gas-Works the bricks intended for retorts are made of Dynas (Welsh) clay, and are 15 inches long, about 2½ inches thick, and moulded to the curve of the sides and top of the retort. The floor of the retort is made of successive lengths of fire-clay tiles, or slabs, about 3 inches thick, except on the two edges corresponding to the sides of the retort, where the tile is rabbeted to receive the lower edge of the side bricks. All the bricks are laid upon a wooden centre and made to break joint with each other. The cementing material is plastic fire-clay, of the same quality as the bricks themselves, and applied just as ordinary mortar would be applied. The retorts being thus successively built up within the bench, a strong heat is put upon them and the joints baked together, just as the several lengths of fire-clay retorts are made to unite in one continuous whole.

At the Goswell street station of the Chartered Gas Company, Mr. Upward, the engineer, employs Cowen's Newcastle bricks in building retorts. At the South Metropolitan, Mr. Livesey also uses Cowen's bricks, each brick being made to lap for half its thickness, at each end, upon those contiguous to it, while grooves, made to secure a better hold of the fire clay used in jointing, are scored in the longitudinal edges. The tiles are made from the Ewell fire-clay, which, although containing sufficient iron to give it a bright red color, and although of a friable nature, almost as much so, indeed, as Bath brick, is scarcely affected by heat. Mr. Livesey adopts a thickness of 3 inches for his retort bricks, and 3½ inches for the tiles forming the bottoms. At the Crystal Palace District Gas-Works, at Sydenham, Mr. Christie adopts Stourbridge in preference to Newcastle bricks for retorts, although, thus far, as in the Commercial works, of which Mr. Christie formerly had charge, he has generally employed clay retorts of the common kind. There is a decided and distinguishing difference in the color of the Stourbridge

and Newcastle fire-bricks, the former having a flesh color, while the latter, when new, are of an almost milky whiteness. It is curious to note that after the lightest colored bricks have been subjected to long service in a gas retort, they are found to have acquired a reddish, and often a dark red color. When broken up, ground under edge runners, and the powder again tempered and moulded into bricks, old fire-clay retorts will come out a deep red. This can result only from the acquisition of iron from the coal carbonized in the retorts.

(To be continued.)

ON COLORING MATTERS DERIVED FROM COAL TAR.

BY W. H. PERKIN, ESQ.

(From the Quarterly Journal of the Chemical Society.)

(Concluded from page 311.)

NAPHTHALINE COLORS.

The beautiful hydrocarbon, naphthaline, which has yielded such a long category of substances to the chemist, has, up to the present time, yielded nothing of practical importance to the dyer. From it the following colored derivatives have been obtained, namely, *chloroxynaphthalic acid, perchloroxynaphthalic acid, carminaphtha, ninaphthalamine, nitrosonaphthalin, naphthamein,* and a body of a purple *color.*

CHLOROXYNAPHTHALIC AND PERCHLOROXYNAPHTHALIC ACIDS.

These acids were discovered by Laurent. They are produced by digesting their chlorides, namely, the chloride of chloroxynaphthyl and the chloride of perchloroxynaphthyl with an alcoholic solution of hydrate of potassium. They appear to be very difficult substances to obtain in quantity. I have not obtained satisfactory results when endeavoring to prepare them; they have the formulæ $C_{10}(H_5Cl)O_3$ and $C_{10}(HCl_5)O_3$ respectively. They are regarded with great interest, as being very closely allied to alizarine, the coloring matter of madder: in fact, they are viewed as chloralizaric acids; that hypothesis is based upon the idea of alizarine having the formula $C_{10}H_6O_3$; but it happens very unfortunately for this theory that the formula of alizarine itself is still a disputed point.

Chloroxynaphthalic acid is of a yellow color; its salts are yellow, orange, or crimson, and are described as possessing great beauty. Silk dyed with the ammonium-salt acquires a good golden-yellow color, little affected by light.

CARMINAPHTHA.

This coloring matter was also discovered by Laurent. It is obtained by heating naphthaline with a solution of bichromate of potassium, and then adding sulphuric or hydrochloric acids. It is described as a fine red substance soluble in alkalies, but precipitated from its alkaline solutions by means of acids. I have never obtained this product when oxidizing naphthalene.

NINAPHTHALAMINE.

Ninaphthalamine is the name given to a remarkable base which was noticed by Laurent and Zinin; but nothing was known of its nature until it was re-subjected to investigation by Mr. Wood, who has both described and analyzed it and some of its salts; its formula is, $C_{10}(H_2NO)N$, or naphthalamine in which H is replaced by NO. It is obtained by passing sulphuretted hydrogen through a boiling solution of dinitronaphthaline in weak alcoholic ammonia. The details of the preparation are described in the 12th volume of this Journal, page 154. It has a bright red color, but I do not think it would be of any value as a dyeing agent, even if it could be obtained cheaply.

NITROSONAPHTHALIN.

This peculiar body is a product of the action of nitrous acid on naphthalamine. It is prepared mixing a solution of hydrochlorate of naphthalamine with nitrite of potassium. From this mixture it separates as a reddish-brown precipitate. This, when washed with water on a filter and then dried, is dissolved in alcohol, filtered, and evaporated to dryness on the water-bath. Thus prepared, it is a crystalline dark-colored substance, having a greenish metallic reflection. It is soluble in alcohol and also in benzole, forming orange-red solutions.

When acids are added to an alcoholic solution of nitrosonaphthalin, it immediately assumes a most beautiful purple or violet color as fine as any of the aniline purples. Alkalies restore it to its original color. Silk may be dyed a beautiful purple shade with this substance, provided a certain quantity of hydrochloric or sulphuric acid be present; but what is most unfortunate is, that when the silk thus dyed is rinsed in water, the color immediately passes back to that of pure nitrosonaphthalin, and, also, that the amount of acid required to keep up the purple shade, if left in the silk, rots it in a few days. Could this purple be fixed, nitrosonaphthalin would become a cheap and most useful dye.

I have endeavored to produce a sulpho-acid of nitrosonaphthalin, thinking that if such a compound could be obtained, it would possess the purple color, because it would be an acid itself. But although sulphuric acid does dissolve it, forming a blue solution, no combination takes place. I also endeavored to produce this desired result by treating sulphonaphthalamic acid with nitrous acid, but obtained only nitrosonaphthalin, the acid of the sulphonaphthalamic acid having apparently separated.

NAPHTHAMEIN.

Piria* observed that naphthalamine and its salts produce blue precipitates, afterwards becoming purple, when brought in contact with perchloride of iron, terchloride of gold, nitrate of silver, and other oxidizing agents. This product of oxidation he terms naphthamein. Silk and cotton may be dyed with it; but the color of this compound is so inferior as to render it useless as a dyeing agent.

Naphthalamine, when heated with anhydrous bichloride of tin, yields a purple coloring matter, which is insoluble in water, but insolubility renders it difficult to use, and its color is not nearly as good as that of aniline purple.

TAR RED.

This coloring matter was discovered by Mr. Clift, of Manchester, in 1853. It is obtained by exposing a mixture of the more volatile parts of the basic oils of coal tar and hypochlorite of calcium to the air for about three weeks. Of the pure coloring matter I know nothing, except that with tanin it forms an insoluble or difficultly soluble substance, and that with different mordants, it yields different colors.

Professor Calvert has been kind enough to send me a leaf of his note-book containing the results of different experiments he made upon this coloring matter, which show that the colors obtained from this product are anything but good.

It seems probable that this coloring matter is derived from the pyrrole.

AZULINE.

This substance, which is a beautiful blue dye, has been introduced into England within the last six months. It was discovered by Messrs. Gunion, Marnas, and Bonney, of Lyons, who keep the process for its preparation a secret. It is obtained from coal-tar; but from which of its numerous derivatives is not known.

This coloring matter is a brittle uncrystallizable body, possessing a coppery metallic reflection. It is very difficultly soluble in water, but soluble in alcohol, producing a magnificent blue solution, having but a slight tinge of red. With concentrated sulphuric acid, it forms a blood-red liquid, which when poured into an excess of water, precipitates the coloring matter unchanged. Dilute acids have no effect upon azuline. Its alcoholic solution mixed with an alcoholic solution of hydrate of potassium also changes to a dull-red color. This, when diluted with water, forms a purple liquid, which is gradually restored to its original blue color by hydrochloric acid. With excess of ammonia the solutions of azuline change to a reddish purple color. This is soluble in alcohol. I have made several experiments with it as a dyeing agent, but have not obtained any satisfactory results. Its ammoniacal solution treated with sulphide of ammonium, gradually assumes a pale yellowish-brown color. Iodine destroys the color of azuline.

In color it is not quite so fine as chinoline blue, though far superior to Prussian blue.

APPLICATION OF COAL-TAR COLORS TO THE ARTS OF DYEING SILK AND WOOL.

Silk and wool can be dyed with all the coal-tar colors, with the exception of the rosolates, these fibres possessing in most cases a remarkable affinity (if I may so speak) for these coloring matters. Many of them, as aniline-purple and violine, are taken from their aqueous solutions so perfectly by these substances, that the water in which they were dissolved is left colorless. In fact, silk and wool take them up so rapidly that one of the great difficulties the dyer has to contend with is to get the fibres dyed evenly.

Dyeing Silk with Aniline Purple, Violine, and Roseine.—One process is applicable for dyeing silk with either of these coloring matters, and it is a very simple one. The alcoholic solution of the coloring matter required is to be mixed with about eight times its bulk of hot water, previously acidulated with tartaric acid, and then poured into the dye-bath, which consists of cold water slightly acidulated; after being well mixed, the silk is to be worked in it until of the required shade. If a bluer shade than that of the coloring matter is required, a little solution of sulphindigotic acid may be added to the dye-bath, or the silk may previously be dyed blue with Prussian blue or any other blue, and then worked in the dye-bath.

To Dye Silk with Fuchsine, Picric Acid, Chinoline Blue, and Chinoline Violet.—This process is still more simple than the above, as it is merely necessary to work the silk in cold aqueous solutions of these coloring matters. With fuchsine or picric acid, a little acetic acid may be used; but with chinoline colors, acids must be avoided. With picric acid, a very clear green color may be obtained by adding a little sulphindigotic acid to the dye-bath.

I may mention that the color of violine is not so fine as that produced by aniline purple and indigo blue; also that roscine is not so good a color as fuchsine.

To Dye Silk with Azuline.—The dyeing of silk with this coloring matter is far more difficult than with the preceding, requiring to go through two or three different processes. This difficulty I believe arises from the insolubility of azuline in water.

The process generally employed is to work the silk in a solution of the coloring matter in water acidulated with sulphuric acid, and when of sufficient depth, to raise the temperature of the dye-bath to the boiling point, and work the silk in it again; after this the silk is well rinsed in water, until free from acid, and worked in a bath of soap lather. It is then again rinsed and finished in a dilute acid bath.

To dye Wool with Aniline purple, Violine, Roseine, Fuchsine, and Chinoline colors.—This operation is generally conducted at a temperature of 50° or 60° centigrade, and the dye-bath is composed of nothing but a dilute aqueous solution of the coloring matter required. Acids should be avoided, or only a very small quantity used, as the resulting colors are not so fine when they are employed.

METHODS OF DYEING COTTON WITH COAL-TAR COLORS.

When aniline purple was first introduced, considerable difficulty was experienced in dyeing cotton so as to obtain a color that would resist the action of soap. Aniline purple is absorbed by vegetable fibres to a certain extent, and very beautiful colors may be obtained by simply working cotton in its aqueous solutions, but when thus dyed, the colors will not stand the action of soap. I have tried the use of tin and other mordants, but without any satisfactory result.

In 1857, Mr. Puller, of Perth, and myself, simultaneously discovered a process by which this coloring matter could be fixed upon vegetable fibres so as to resist the action of soap. This process is based upon the formation of an insoluble compound of the coloring matter with tannin and a metallic base in the fibre.

To effect this, the cotton has to be soaked in a decoction of sumach, galls, or any other substance rich in tannin, for an hour or two, and then passed into a weak solution of stannate of sodium, and worked in it for about an hour; it is then wrung out, turned in a dilute acid liquor, and then rinsed in water. Cotton thus prepared is of a pale yellow color, and has a remarkable power of combining with aniline purple. The above process may be modified, as for example, the stannate of sodium may be applied to the cotton before the tannin, and alum may also be used in the place of stannate of sodium. To dye this prepared cotton with aniline purple, it is only necessary to work it in an acidulated solution of the coloring matter; when thus prepared, the cotton will absorb all the coloring matter of the dye-bath, leaving the water per-

* Ann. Ch. Phys. (3) xxxi, 217.

fectly colorless. It has been found that cotton thus prepared can be dyed with any coloring matter that forms an insoluble compound with tannin. It is therefore used for dyeing with roseine, violine, fuchsine, and chinoline colors.

Cotton may also be dyed a very good and fast color by mordanting it with a basic lead-salt, and then working it in a hot solution of soap, to which aniline purple has been added.

Oiled cotton, such as is used for dying with madder, is also used in dyeing these colors. Cotton simply oiled, and before mordanted with alum and galls, absorbs coal-tar coloring matters with great avidity, producing very fine shades. Oiled cotton mordanted with alum and galls also combines rapidly with these coloring matters: but as the color of the prepared cotton is generally rather yellow, it interferes sometimes with the beauty of the result.

Cotton is sometimes washed with albumin, which is coagulated by the action of steam, and the albumin, which covers the cotton, dyed in the usual manner.

I may mention that violine, roseine, fuchsine, and also the chinoline colors, combined with unmordanted vegetable fibres as well as aniline-purple. Picric and rosolic acids are not applicable for dyeing cotton.

Printing Calico with Coal-tar Colors.—The process generally employed for printing with these coloring matters is simply to mix them with albumin or lacterine, print this mixture on the fabric, and then to coagulate the albumen or lacterine by the agency of steam.

Mr. Grey, of the Dalmonach Print-works, and myself, discovered the first process of applying these substances to fabrics in a different manner to the above.

It consisted in forming a basic carbonate, or an oxide of lead, on those parts of the cloth which were to be colored, and then working the cloth thus prepared in a hot lather containing the coloring matter. Where the cloth was mordanted with the lead-compound, the coloring matter was absorbed; but where immordanted it was left white, because pure cotton is not dyed with these coloring matters in the presence of soap. This process was intended for the application of aniline-purple, for, at the period of this discovery, the other coal-tar colors were unknown. Colors dyed by this process were very pure; but it had many disadvantages which have caused it to be disused.

Lately the process previously described for dyeing colors upon cotton prepared with tannin, has been applied to calico-printing. It consists in printing tannin upon the fabric previously prepared with stannate of sodium, and then dyeing it in a hot dilute acid solution of the coloring matter (in the case of chinoline colors acid must not be used); by this means, the parts of the fabric which are covered with tannin are dyed a deep color, but the other parts are only slightly colored. These are cleared by means of well-known processes.

This method of applying these coloring matters is also modified by printing a compound of the coloring matter required and tannin on the prepared cloth, instead of the tannin only, and then steaming the goods.

Method of applying Aniline Green to Fabrics.—This process, which is interesting, as being the first example of the production of coal-tar colors on the fabric itself, was proposed by Professor Calvert: it is very simple. The design is to be printed on the cloth with a thickened solution of chlorate of potassium, dried, passed through a solution of an aniline salt, again dried, and allowed to hang in a moist atmosphere. In the course of two or three days, the color will be fully developed. The color thus produced may be changed into a dark blue by the agency of soap or an alkaline liquid. This process is very inexpensive; the amount of aniline required being very small.

Application of Nitrosonaphthalin.—If cloth is printed with a thickened solution of a salt of napthalamine, dried, and then passed through a solution of nitrite of potassium, nitrosonaphthyline will rapidly make its appearance as a reddish-orange color; but unfortunately the color thus obtained will not resist the action of soap.

Many of the coal-tar colors, when viewed by artificial light, are very much modified in tint; and some of them, when compared with similar colors of vegetable origin by daylight, appear of totally different tints by gas-light. The latter case is remarkably illustrated by aniline-purple and archil.

If two silk patterns are died, one with aniline purple, and the other with archil, of exactly the same shade of color when seen by daylight, the color of the archil pattern when viewed by artificial light, will appear several shades redder than that of the aniline purple.

Dr. Gladstone has examined solutions of these two coloring matters in a hollow wedge by means of the prism, and he finds that a very thin stratum of aniline-purple attacks the spectrum in the yellow (just beyond D), giving rise to a blue-purple color; and that, as the intensity of the solution increases, the absorption gradually extends very slowly on the less refrangible side, but rapidly on the more refrangible side, till the green entirely disappears, and eventually the true blue.

In the case of archil, the violet and blue rays are absorbed by a strong solution of this coloring matter, though it still permits the extreme *red* ray to pass with great facility: therefore, considering the abundance of red in oil or gas-light, it is not surprising to find that archil colors appear redder by artificial light than those of aniline purple.

The color of the three coal-tar blues, *bleu de Paris*, *azuline*, and *chinoline-blue*, when viewed by gas-light, are considerably modified. The *bleu de Paris* appears blue; azuline, a heavy blueish violet; while the chinoline-blue assumes a beautiful violet tint having rather a cast of red.

Dr. Gladstone has also kindly examined these three coloring matters, and gives the following account of his results:—These three blues, in common with aniline purple, attack the spectrum in the yellow (near D), and as the intensity of the color increases, the absorption extends, especially on the more refrangible side, till the *green* is swallowed up. At the same time the *orange* is absorbed, while the extreme red is transmitted freely.

In the *bleu de Paris* there is an additional band of absorption in the orange, when very weak solutions are examined; but this is soon merged in the greater band extending from the yellow as the solution increases in intensity.

Strong solutions of azuline absorb the yellow, green, blue, and violet in regular order; but the chinoline blue absorbs the violet when not very deep, and allows the blue to pass for some distance further, after which the *red* alone passes.

Dr. Gladstone states that the chinoline blue is one of the most beautiful dichromatic substances he knows; when viewed in a hollow wedge, with the prism, it passes gradually from a clear blue to a fine red.

Of the numerous coloring matters of which I have briefly spoken, there are only four that are at present employed by the dyer and printer, namely: aniline purple, fuchsine, picric acid, and azuline; but I think it probable that others of them will soon be introduced, such as the bleu de Paris. Nitrophenylene-diamine might also be used for silk-dyeing, as its color is good, and it resists the action of light well.

Unfortunately the chinoline colors, though very beautiful, are most fugitive. There has been an endeavor to introduce the chinoline blue of late; but, although a considerable quantity of silk was dyed with it at first, it is now scarcely used, because, when exposed to the sun for two or three hours, the dyed silk becomes bleached.

Aniline purple resists the light best. Fuchsine and alpha aniline purple soon fade, especially when on cotton. Azuline and bleu de Paris are not easily acted upon by light when on silk.

When the coloring matters of coal-tar were first introduced, there was great fear that the workmen engaged in their manufacture would suffer in health. All I can say is, that during the few years I have had to do with this branch of manufacture, there has not been a single case of illness among the workmen that has been produced by any of the operations carried on for the production of *aniline purple*.

Petroleum for Japan.—An agent of the Japan Government is said to have contracted with the Queen City Oil Company, Buffalo, N. Y., for four hundred gallons of petroleum.

The Turkish Bath.—It is well known that subscriptions are now being made towards the establishment of a Turkish bath in this city, under the auspices of a number of our leading physicians and other prominent men. This bath has been very highly recommended as a curative and preventive of many forms of disease, and its advent is looked for with some degree of interest by those who have read of its mode of operation, but who have never personally experienced the process. The London *Lancet*, which is a recognized authority in medical matters, criticizes the bath with considerable force, and arrives at the conclusion that it is useless to healthy men and absolutely injurious to many invalids. Even the advocates of this bath admit that there are some conditions of the system in which no benefit could be conferred, but rather an injury done. It is well to ponder on the probable effects of the Turkish bath while the question of inaugurating one in our midst is in abeyance. We quote a portion of the *Lancet's* remarks:

"The application of heat and friction bears no relation to cleanliness; the most perfect cleanliness may be attained by soap and water. The stimulation of the skin to renew its epidermal coat by steaming and rubbing is not a process of cleansing, any more than blistering it, or effecting a similar renewal with tincture of iodine. Nature has been so bountiful and provident as to provide the body with the means of resisting great extremes, whether of heat or cold. The processes of life can only be carried on at a temperature nearly invariable, or varying within very narrow limits. To combat cold climates there is a great power of producing heat internally in the body; and to combat high climates the body is provided with an evaporating apparatus—the skin. That profuse perspiration which some gentlemen regard with such triumph, is the protest of nature against their hot chambers. It should be their humiliation. If they could carry out their theories, and act upon the body by heat as they would upon meat, they would indeed produce an alteration of temperature in the tissues which would effect a cure of all diseases—a *dead* cure; their patient would be *mort guéri*. But, fortunately for themselves, they cannot prevent the compensating balance which nature has placed there to oppose great alterations in the temperature of the body. They cannot remove it; but they may overstrain and crack it. The palpitating heart, the rapidly expanding lungs, may yield beneath the strain, and blood may flow, fainting may follow, or death result. This is what medical practitioners know, and would feel themselves culpable if they lost sight of. Nothing seems more unlikely and undesirable than that the Turkish bath should ever become the habit of a large portion of our population."

This is one view of the subject. Of course the other side can produce recommendations from as eminent authorities to sustain their views. It is well to look at both sides of the question, and examine the evidence impartially. If the Turkish bath really possesses the valuable qualities its advocates claim for it, its permanent establishment will prove a boon to the community, and in a hygienic point of view will subserve a most useful end.

Gas in India.—The prospectus of the Singapore Gas-light Company has just appeared in some of the English papers. This company has been formed for the purpose of supplying gas to the British settlement of Singapore, which, it is said, contains a population of more than 80,000, with about 5,500 houses, exclusive of churches and other public buildings. Singapore has been heretofore lighted with oil; but the inhabitants, having become convinced of the superior advantages of gas light, are about to make a practical trial of its merits.

The estimates which have been made by competent engineers, show that gas of 18 candle power can be furnished at about $3.37 per thousand cubic feet, and the calculations on the workings of the company show a profit of upwards of 12 per cent. on the capital laid out. The capital stock of the company is £100,000 in 20,000 shares of £5 each.

Gas in France.—The amount of gas consumed in Paris in 1861, shows an increase of 20 per cent. compared with the consumption of 1860.

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It is seldom that important innovations are introduced in the details of manufacturing processes without meeting prejudices to be encountered and old associations to be overthrown, which frequently make a vigorous resistance to any change, no matter of what nature it may happen to be. In the introduction of clay retorts, and their substitution for those made of iron, this assertion has been again and again verified. The aversion which many engineers have exhibited towards clay retorts has at first been very strong, and this fact we consider a great argument in their favor, for the act of overcoming such prejudices, and adopting the more valuable clay retorts in the place of iron, has been a practical acknowledgment of previous error, which only a conviction of value could have occasioned.

Our attention has been drawn to this subject, by the expressed opinion of two prominent gas-engineers, directing the works supplying two important cities. These opinions, which are based upon actual experiment, and which we have no doubt were conscientiously and carefully conducted, are diametrically opposed to each other. We refer to the opinions of THOMAS PRATT, Esq., engineer of the St. Louis, Mo., Gas-Works, and JOHN C. CRESSON, Esq., engineer of the Philadelphia, Pa., Gas-Works. We have published the reports of these gentlemen on pages 244 and 292 respectively of this volume, of which we here reproduce an extract from each. The opinion of Mr. PRATT is thus expressed:

"By referring to last year's report, you will see that at the close of the year I was working 78 retorts, 75 of which were clay, and 3 iron. I am now working 57 retorts, all of clay, 48 of which were in use at the time of my last report, and 30 of them had been working 17 months; they are still in good working order. This year, owing to the superiority and extra durability of the Belgian clay retort over the iron ones, we have not had to buy any; and still have on hand 40 unset, for the coming year. We shall need but a small amount of brick and tile for repairs."

Mr. CRESSON'S views differ materially from these, as may be seen from the following sentence in his report to the trustees of the Philadelphia gas-works:

"The experiments with clay retorts have been continued through most of the year on a scale of considerable magnitude, and have again failed to yield results as economical as are obtained by iron retorts worked in our usual way."

It is a matter of no uncommon occurrence to see well informed men differ on purely abstract questions of science, where theory alone forms the basis of opinion. Professional men in all branches of learning have thus differed, and where the questions at issue are of merely a speculative character there will continue to be a wide diversity of opinion, as it is impossible for all men to think alike. But when we see a divergence so broad as the above extracts exhibit, where the mooted point is decided by investigations based upon exact experiment, continued for a long period of time, it is somewhat remarkable to note the wide discrepancy between the results, and the opposite conclusions reached by the respective parties. It is to be regretted that such antagonistic convictions are entertained respecting the comparative merits of clay and iron retorts, especially by individuals so prominent in the profession as the gentlemen above named. Both occupying positions of eminence, and being widely known on account of their scientific attainments, their opinions would be naturally regarded with more confidence than the views of many other engineers; and had their experiments induced their impressions to accord, their united testimony would have gone far towards settling the question, and many doubts now prevailing in the minds of others would have been satisfied. But as the testimony is conflicting, it will be well to seek the opinions of other prominent engineers, and see on which side the weight of evidence accumulates.

We have before now discussed the comparative merits of iron and clay retorts, and cited the words of many prominent gas-engineers who have no hesitation in pronouncing in favor of the latter. Not only have the claims of clay been fully sustained by their former advocates, but the signal recommendations which this material offers over those presented by iron have attracted the observation of many engineers to whom its use was a new thing, and we have yet to hear of any adverse opinions respecting clay retorts, such as that mentioned by Mr. CRESSON, when they have been worked on a scale of any magnitude. On the contrary, the testimonials in their favor are numerous and marked by a directness of statement, based upon careful and repeated trials. In Europe, ever since their advent, clay retorts have been gaining ground with a steadiness which only valuable innovations can aspire to, and they have almost entirely superseded the use of iron. In this country, where their progress has been slower, it has been at least as sure. With very few exceptions they are principally employed in all the large cities, the works at Philadelphia, Pa., and Boston, Mass., being among the very few exceptions to this general statement. At the Manhattan and New York gas-works of this city, iron retorts will soon be remembered only as relics of bye-gone days; and at Albany, N. Y., Brooklyn, N. Y., Buffalo, N. Y., Zanesville, O., and many other places, clay retorts have proved their superior value both in durability and in the quantity and quality of the gas made.

In view of these facts it is surprising that Mr. CRESSON'S experiments have not justified his favoring clay retorts. No other man in his calling is more highly esteemed both professionally and socially; and few engineers can lay claim to the learned accomplishments of which he is master. Having charge of works magnificent in their proportions, and more complete in all their details, perhaps, than any gas-works in America, he has facilities at hand for thorough investigation which few are fortunate enough to possess. Opinions coming from such a source carry a degree of weight with them which would else have little influence; and hence it is that the results of experiments at the Philadelphia works are regarded by many of the profession as *the* dicta by which important questions are settled. In this respect the experience of working clay retorts during the current year will be looked for with unusual interest, and we hope the testimony will accord with that which the experience of the most enlightened engineers in other places has justified. The subject is one of too great importance to be ignored, or even lightly considered; for the spirit of the age, as well as a consideration of sound economy, alike demand an impartial verdict in a question which has now for years been a bone of contention, and which it would be well to have resolved away. As the case now stands, with all due deference to Mr. CRESSON'S opinion, we can but say that the bulk of evidence tends to verify the results of Mr. PRATT'S experiments, and leads us to hope that other and better results may yet be attained at the Philadelphia works.

On another page will be found an extract from the report of ROBERT E. ROBERTS, Esq., Secretary of the Board of Water Commissioners of Detroit, Mich., respecting assessed water-rates. We have seldom seen the question so ably discussed; although the same subject has been repeatedly argued, and the *pros* and *cons* sustained with signal abiliy, in many other places. The "agrarian idea" is especially affected by certain agitators, who would cloak their really selfish motives, with reasons of a higher character; and assuming a guise of philanthropy, they take sides with that which is most popular with the unthinking portion of the community. The absurdity of the idea that water raised and distributed by costly means, should be gratuitously furnished, is about on a par with communism generally; and if the question were rightly presented, the folly of the ground assumed by its advocates, would be seen. But Mr. ROBERTS might have gone even further, and proved that not only is the agrarian idea utterly untenable, but that the common method of assessing water-rates, is anything but equitable in its nature; and that by this method small consumers are unjustly taxed by the excesses of those who use and waste large quantities of water, and yet who pay no more than consumers who use but a tithe of their amount. The remedy for this state of affairs is easily applied. We have often referred to the water-meter as the only equitable means of indicating the amount which each water-taker should be charged; and our opinions will soon be recognized as just and proper by those who now oppose them. The introduction of water-meters has been and still is with a large number of consumers, an unpopular measure; but those who have witnessed the effects of these instruments, however opposed to them they may formerly have been, have at length become convinced of the propriety of adopting them, and thus relieving the large body of consumers from a burden, which has been placed upon the shoulders of those to whom it rightly belongs. What would be thought by gas-engineers if gas were distributed to families at so much per head, or charges were regulated by the number of front feet of the lot on which a building stands? The idea is too absurd for a moment's attention. But it is argued by the oponents of water-meters that water is different from gas in costing nothing *per se*, while gas does represent a certain value. Very true: but if gas were distributed at the mere cost of evolving it from coal, without taking into consideration the expense of the storing and distributing apparatus, there would be some degree of plausibility in such reasoning. But as the expense of serving it to consumers *after* it has been generated constitutes a principal part of the outlay of gas companies, the price is correspondingly enhanced. Thus even this argument really proves nothing. But the soundest argument, and one which cannot be gainsaid by opponents of water-meters rests on the broad ground of sound economy, that value must be rendered for value. Water is raised into reservoirs and distributed throughout cities at a certain cost per gallon. Consumers, whether they use little or much of this water, absorb a certain amount of this power which is represented by money value; and the only way to prevent injustice to some by overcharges to pay for the extravagance of others, is for each consumer to pay for just the amount he uses. This amount the meter indicates; and the meter alone is capable of acting as the arbiter of water charges.

On other grounds the meter should be advocated. Its general introduction would tend to check waste and extravagance, and instead of companies being compelled to make repeated extensions of reservoirs, the economy which the use of meters would induce would save the expenditure of much money which otherwise would be invested in these additions. The experience of those water companies who have introduced meters is convincing on this point, and other companies would do well to examine the matter which we are confident would redound to their own benefit, as well as insure an equitable system of rates by which their consumers would profit.

THE GAS-WORKS OF LONDON.—The interesting paper on the gas-works of London, which we publish in another column, is from the pen of ZERAH COLBURN, Esq., editor of the London *Engineer*, to whom we tender our acknowledgments for the early proof sheets. London being the city where gas-light was first practically adopted on a large scale, and having more gas-companies than any city in the world, affords a field for many interesting technical observations, which repay close attention. Mr. COLBURN'S large experience in all branches of engineering, gives him a ready facility for illustrating his subject. His many friends on this side of the Atlantic will be glad to renew their acquaintance with him, through his article which we transfer to our pages.

THE STERLING COAL.—On the last page is the advertisement of this excellent coal, which is becoming more generally used among gas companies as the most economical coal known. We commend it to the attention of gas engineers.

R. H. GRATZ & Co.'s METERS.—The old firm of Code, Hopper & Gratz having been dissolved, Messrs. R. H. GRATZ & Co. succeed them in the manufacture of gas-meters, as their advertisement in this number indicates. Mr. Gratz is so thoroughly identified with the gas interest, and his meters are so universally adopted, that it is unnecessary to say more than that he is at the head of the new house, and is prepared to execute orders for the very best description of meters.

PATENT-OFFICE NOTICES.—Reference is called to the notice of the Hon. D. P. Holloway, Commissioner of Patents, whose administration of the Patent-Office is noted as most efficient, judicious, and of signal ability.

ANSWERS TO CORRESPONDENTS.

P. E. F., of Ky.—*The process you refer to for making water-gas, is that of White, which materially differs from Sander's patent. The latter process is followed at Aurora, Ind., and several other places, and it is said, gives satisfactory results.*

R. P., Jr., of Me.—*We should consider a 3-foot burner much too small, and should not make any calculations unless 5-feet burners are adopted. We advise you to consider this matter well, before hastily acting in accordance with your first notions.*

E. D. L., of N. Y.—*We expect shortly to publish an article on the subject, wherein your question will be fully answered.*

M. T. M., of N. Y.—*We do not think it will pay. In England the circumstances are so different as to account for its adoption in that country. Lime is the principal, if not the only agent used here.*

E. V. T., of Md.—*We do not know anything about the description of pipe you refer to. It cannot be used to any extent, or we should have heard of it. Stephenson's wooden pipe, and the bituminized paper tubing, are the only valuable substitutes for iron with which we are acquainted. The latter, particularly, is highly commended, and in England is very extensively used.*

J. W. T., of Pa.—*We have not examined any specimens of Canadian oil. It is said to be of a considerably lower specific gravity than the Pennsylvania and Ohio petroleums, and consequently more valuable for burning and lubricating purposes.*

R. C., of Ind.—*Antisell and Gesner are the latest American works on the subject. You will find some valuable practical directions in either of them. It is the Albert coal mine, situated in Nova Scotia, to which you have reference. It was at one time considered a most valuable property, but the petroleum wells have almost ruined its prospects.*

A. B. F., of Minn.—*If you make sawdust in sufficient quantity, you may make a very rich gas from it. We have known of this being done in several instances. If the wood is dry, 80 lbs. of it ought to make about 500 feet of a very fair illuminating gas.*

CORRESPONDENCE.

GWYNNE'S WATER-GAS.

To the Editor of the AMERICAN GAS-LIGHT JOURNAL:

White Plains, N. Y., 21st April, 1862.

We are now under full headway with my Water Gas Works, and as you have taken considerable interest in my experiments, I thought I would let you know of my success. We lighted the town permanently on the 19th, and the quality of the gas gives general satisfaction. We are using ordinary Ramsey cannel for corbonizing at present, but in a few days I will send you the results from Petroleum. The yield from the cannel is at the rate of 16,000 cubic feet per ton of 2,000 lbs., and in a few days we expect to bring it up to 18,000 cubic feet; the gas is as brilliant as city gas passed through my naphthalizing apparatus, so you can judge of its quality. I hope to see you up this way soon, and also invite all parties interested in gas matters to call and examine for themselves, and all information will be cheerfully given. Yours, respectfully,

W. H. GWYNNE.

BOYDEN PREMIUM.

Uriah A. Boyden, Esq., of Boston, Mass., has deposited with the Franklin Institute, of Philadelphia, Pa., the sum of one thousand dollars, to be awarded as a premium to "any resident of North America who shall determine by experiment *whether all rays of light, and other physical rays, are, or are not, transmitted with the same velocity.*"

The following conditions have been established for the award of the premium:

1. Any resident of North America, or of the West India Islands, may be a competitor for the premium. The southern boundary of Mexico being considered as the southern limit of North America.

2. Each competitor must transmit to "Wm. Hamilton, Actuary of the Franklin Institute, Philadelphia," a memoir describing in detail the apparatus, the mode of experimenting, and the results; and all memoirs received by him before the first day of January, one thousand eight hundered and sixty-two (1862)*, will, as soon as possible after this date, be transmitted to the Committee of Judges.

3. The Board of Managers of the Franklin Institute shall, before the first day of January, one thousand eight hundred and sixty-two, select three citizens of the United States, of competent scientific ability, to whom the memoirs shall be referred; and the said Judges shall examine the memoirs, and report to the Franklin Institute whether, in their opinion, any, and if so, which of the memoirs is worthy of the premium. And, on their report, the Franklin Institute shall decide whether the premium shall be awarded as recommended by the Judges.

4. Every memoir shall be anonymous, but shall contain some motto or sign by which it can be recognized and designated, and shall be accompanied by a sealed envelope, endorsed on the outside with the same motto or sign, and containing the name and address of the author of the memoir. It shall be the duty of the Actuary of the Franklin Institute, to keep these envelopes securely and unopened until the Judges shall have finished their examinations; when, should the Judges be of opinion that any one of the memoirs is worthy of the premium, the corresponding envelope shall be opened, and the name of the author communicated to the Institute. The other envelopes shall be destroyed without being opened.

5. Should the Judges think proper, they may require the experiments described in any of the memoirs to be repeated in their presence.

6. The memoir which may obtain the premium shall become the property of the Franklin Institute, and shall be published as it may direct. Any unsuccessful memoir will be returned to the author at his request.

* The time for receiving the memoirs has been extended to January 1st, 1863.

ASSESSED WATER RATES.

We have received the annual report of the Board of Water Commissioners of the city of Detroit, Mich., for the year ending December 31, 1861. The crowded state of our columns prevents our giving an abstract of the condition of the works. The report prepared by Mr. Roberts, the secretary of the Board, is one of the best written documents of the kind we have ever perused. That portion of it referring to assessed rates of water presents such a common-sense aspect of the whole question—now so frequently discussed in many large cities—that we give it entire, only regretting that the great length of the report prevents us from publishing other portions of it. Mr. Roberts says:

The agrarian idea of conveying water to a whole community, at the exclusive cost of a portion of it, is again agitated by a portion of this community.

The present system of supplying the city with water was inaugurated by the Common Council in 1836, and continued by the present Board of Management, after careful and thorough examination of all others within their knowledge, believing it to be equitable in its operation, and in accordance with the genius of our free institutions, that all should maintain themselves from their own resources so long as they are able to do so; and when they are not, they should be maintained by the public at large.

The truism that "water should be as free as the air we breathe," no one will dispute, and it is so, in this community—all have free access to the broad, pure stream that flows past the city. It would, of course, be attended with some trouble and expense for individuals to go there for their supply, and it is this that the public have undertaken, by the construction of the water-works, to avoid and lessen. The water in the river, at the source of supply, costs nothing; but to construct works to convey it, and to provide power to force it to and into the very dwellings of the inhabitants, does cost something. And the question now is, who should incur this expense? Those deriving and enjoying the sole benefit, or the whole community, including a large portion who derive none of the benefits whatever?

The works *were constructed* at the cost, or on the security of the whole property in the city, while not more than one-half of the entire area is directly benefited. Yet it is now proposed to tax the one-half that does not receive or require any direct benefit, equally with the other half, that requires and receives the entire benefit. The *means* having been provided to procure a supply of water, the demand is now made to *furnish* that supply. There is property to the value of millions of dollars situated along the river front, the value of which is enhanced by its being thus situated, with an abundant supply of water of easy access, and in the suburbs of the city, upon which water is not taken or required from the works, which is alike pledged with other property upon which water is taken and required, as security for the loans made to construct the works. To tax such property to furnish water to other sections that use and require it, would manifestly be unjust.

To carry out this idea of "free water," or, more properly, to convey water free of expense to those requiring and using it, and maintain the works by general tax, as is proposed, would involve, now, an addition of $60,000 to the annual city tax, which, in a brief period of time, would be increased to $100,000 and more. For every one subject to a tax to maintain the works, would, of right, claim the right to use the water for whatever purpose required, and however remote the taxed property may be from the distribution pipes, they would demand the extension of the pipes to it.

If the principle of universal taxation to supply an article of necessity or luxury can constitutionally be forced on to the citizens of Detroit by legislative enactments, it can be forced on the citizens of every other city and village in the State, and any of them would have a right to demand the passage of a law requiring the construction and maintenance of water-works by a general tax. Let this right be conceded, and "free light" will next be demanded with equal propriety, and the passage of laws requiring the construction and maintenance of gas-works by general tax. Then free bread, free meat, free vegetables, etc., until every commodity, articles of necessity or luxury,

will be furnished by general tax, and we become, practically, a community of agrarians.

It is possible that this theory may have found advocates among those who have not given the subject that investigation its importance would seem to demand. Therefore, it may not be deemed improper to reproduce the following suggestions on this subject, submitted in my assessment report six years ago, when it was last before discussed:

During the past season, a movement having been made to abolish the system of assessing water-rates to defray the expenses of maintaining water-works, and to levy the required amount to meet the annual interest on the loans effected for their construction and the current expenses, by a general tax on all the real and personal estate of the city, and having for six years, while engaged in an official capacity in another branch of the municipal government, had much to do with the levying and collecting of water-rates, and for the past three years having had the entire direction of the same, subject to your approval, I deem it proper to submit the following suggestions with regard to the proposition, which embraces a wide field of inquiry and discussion, and is one which involves many questions of finance and expediency. The proposition is not a new one, for often, at intervals, this or some apparently popular movement on the subject has been proposed, ever since the purchase of the works by the city, and to the agitation of the subject, perhaps more than any other cause, is to be attributed the slow increase of revenue formerly derived from the rates, which were insufficient to meet the annual current expenses of the works.

The able report of the City Attorney, made to the Common Council in April last, on this subject, furnishes a complete argument against "legislative enactments authorizing a general tax for the purpose of supplying citizens with water for their daily use," and fully explains "the principle involved in this plan of universal taxation to supply a necessity of life—an article of food—which at once stamps it as undemocratic, and contrary to the genius of our free institutions."

In the public discussions and official proceedings, four years ago, relative to the subject of placing the water-works under a separate board of management, for the purpose of reconstructing and enlarging the works, and furnishing the city with a more bountiful supply of water, the matter of revenue to be derived from the same by so doing held a conspicuous place among the reasons urged for the adoption of the plan; and it is not probable that the necessary laws giving authority to borrow money for that object, pledging the faith and credit of the city, could have been procured, while it is, at least, doubtful whether the loan could have been effected without a pledge of revenue to meet the annual interest, and to create a sinking fund to meet the final payment of the debt. To levy and collect an amount sufficient to meet the annual current expenses of the works and interest on the loans on the real and personal estate, would add about fifty thousand dollars to the city taxes annually, and, it is believed, would create inequalities and burthens more monstrous than any that can possibly exist under the present system. Such a system, if adopted, would subject to a proportionate burden property to the value of millions of dollars, situated all along the river front, and lands that are now used for farming purposes within the limits of the city, upon which water from the works is not and never will be taken; while property to the value of several millions more, which *is exempt from municipal taxation* by legislative enactment—railroads, banks, &c.—would enjoy the benefits of the use of the water without the payment of any compensation whatever.

Water-takers generally cheerfully and unrepiningly pay the rates assessed, and in so doing they have felt that for this rate (for in no sense can it be regarded as a tax), at least they get the worth of their money; for who would be deprived of the luxury of having a free, abundant, and constant supply of pure water conveyed into their very dwellings, for five times the amount they are required to pay? In fact, by any other mode, five times the amount would not pay for the labor of hauling the water.

The gross injustice of such a procedure must be apparent to all, and such especially will be the conviction of every one after a careful examination of the subject.

As a measure of finance, it is certainly very objectionable. The large funded debt of the city seems to admonish us as a city to husband all our resources, prominent among which is the amount paid by water takers, which is not subject to the objections commonly entertained against the payment of city taxes, because a tangible present and unmistakable equivalent is received for the amount paid.

The parties favoring the change alleged that, under the present system, "the poor man is taxed for keeping the hydrants and cisterns filled with water for the purpose of extinguishing fires, when in fact he is not the possessor of a single dollar's worth of property incurring any danger from such a source." While it is not conceded that there are any water-takers so poor that they do not desire protection against fire, and, if there are, water is furnished to such without charge, I propose to show that such protection is paid for by direct tax. The city had expended for the construction of water-works, before the works were placed under control of the Board of Commissioners, $181,000, the annual interest upon which is $12,670, the payment of which is assumed by the city, and raised by direct tax, annually, on all the real and personal estate in the city. There are in the city 202 fire-plugs and 77 street reservoirs, total 279. The amount usually paid by cities to hydraulic companies for supplying such with water is five dollars per annum for each fire-plug or reservoir, which would amount to the sum of $1,395 per annum. But it may be objected that of this sum of $181,000 paid for construction, there is not $100,000 worth of the material now in use. Grant it, and grant still further, that when the present work of reconstruction is completed, there will not be $50,000 valuation of the old works remaining in use; still the interest on this amount is $3,500 per annum, which is to be paid by general tax, and is sufficient to pay for supplying 700 fire-plugs and reservoirs.

Another reason urged was, that "every vacant lot within the city limits is increased in value, and a much higher price obtained, by running iron water-pipes by them, preparatory for sale, as is the fact at the present moment, their owners not being willing to pay a single farthing for such great and important improvements." That every vacant lot is enhanced in value by the water-pipes being accessible, is granted, (and a proportionate increase of city taxes follows,) but that the owners of such lots are unwilling to pay, and do not pay, for such improvement, is denied. The total amount expended by the city for the construction of the works and deficit of the annual revenue to meet the current expenses before placing the works under the management of the Board, was $266,000—which amount was assumed by the city—the annual interest on which is $18,620, and is now paid by a general tax on all the real and personal estate of the city.

The supposition that the assessors and collectors would be dispensed with by the change, and "therefore the saving to the city must be large on these two items, amounting to some thousands of dollars per year," would not be realized, for there are but few buildings that would be exempt from extra rates, for which an additional charge is now properly made, unless it is intended that such should also be supplied free of charge. Additions and alterations are constantly being made to residences, such as bathing apparatus, fountains, street sprinklers, &c., &c., requiring all the vigilance the department can exercise to detect. Besides, there are numerous manufacturing establishments, breweries, liveries, taverns, &c., the rates on which vary from ten dollars to three or four hundred dollars per annum; surely it is not proposed to convey water to all such without charge, at the expense of taxpayers generally.

The rates charged are not for the Detroit *river water*, but for *conveying* it to the premises of consumers, and such service has a fixed, permanent, and unchangeable value, to wit, the cost per hundred gallons of delivering the same, and such rates are graduated by the Board to meet the requirements of the works to pay the annual interest and contingent expenses, and are meant to be as nearly according to the quantity consumed as possible. If the rates could be fixed exactly in proportion to the quantity of water delivered, no one would question the correctness of the principle any more than they would for being charged for conveying a certain number of cords of wood from the river to their premises. Every one would then be charged for what they chose to use, or required to be delivered, and no more. This can be ascertained by requiring all consumers to affix a meter to their service pipes, which would accurately register every gallon of water delivered, when payments could be made at a fixed rate per gallon. This, however, would involve a heavy expense to takers for meters, which they would regard as oppressive.

The principles upon which rates are assessed by most of the water-works in the United States have been carefully examined and considered, with the view of devising and adopting, if possible, a more equitable mode for these works. But it is believed that the system adopted by the board, which differs from all others, and which is substantially the same as that pursued since the first establishment of the works in this city, (nearly thirty years ago,) operates with greater equality, more to the general satisfaction of water-takers, and under which, with moderate discretionary power granted to the assessor, rates may be fixed approximating nearer according to the quantity of water consumed, than under any other system examined.

Rates are fixed in some cities upon the basis of valuation of the property, according to the tax list where water is taken; others according to the size of the buildings; others according to the number of feet front of lot occupied; while others again are according to the number of feet front of lots fronting on streets through which water-pipes are extended, whether water is taken upon such lot or not; *but in no case whatever, in the United States or elsewhere, are works maintained by general tax.* The foregoing rules apply only as to families, while special rates are fixed for manufacturing and other purposes. Many water-takers in the city are under the impression that, in cities where they formerly resided, they were not charged for water used from public works. In this, they are certainly mistaken, for, if they did not pay directly to the works, they paid for it in the amount paid for the premises occupied.

The system adopted by the Board of Water Commissioners in this city fixes the rates to be charged according to the number of persons residing on the premises assessed, and the uses made of water on such premises, thereby rating as near as may be, without the use of meters, according to the quantity consumed. It is, and has been, the aim to keep the rates charged to families as low as possible, and defray the current expenses, the minimum price charged for families being but four dollars per annum, or a fraction more than one cent per day, which is lower than that established by any other water-works board in the country, and more than one-half less than many.

Under the present management of the works, the public have assurance that the poor never will be oppressed. When rates are being assessed on premises occupied by a large family, and appearances indicate, or an intimation is given that a full assessment would be oppressive, they are invariably set down at the lowest rates; and, if any are unable to pay that amount, upon that fact being certified by the Director of the Poor, the secretary, under the ordinances of the board, issues to them a permit to procure water *free of charge.*

In conclusion, it is deemed essential to the prosperity of the finances of the city government, and indispensably necessary for the preservation of any control whatsoever over the consumption and waste of water, and an unlimited number of connections being made with the distribution pipes of the works, to preserve and continue the system of assessing water rates as heretofore.

* * * * * * *

The following water rates are charged in Detroit.

PRIVATE FAMILIES.

For every family, consisting of not more than three persons, five dollars per annum; for every family of four persons, six dollars; for a family of five persons, seven dollars; for a family of six persons, eight dollars; for a family of seven or eight persons, nine dollars; for a family of nine and not more than ten

persons, ten dollars, and one dollar for each additional person.

Bathing Apparatus, from two to five dollars.

Water Closets, from three to eight dollars.

Garden Hose and *Street Sprinklers*, from three to ten dollars.

Horse, one dollar and fifty cents. *Cow*, seventy-five cents.

Carriages, two horse, one dollar; one horse, fifty cents.

Fountains, special rates.

MISCELLANEOUS.

Stores, Offices and Shops, from two to twenty dollars.

Foundries, Machine Shops, Printing Offices, and other places where engines are used, one and a half cents per barrel, meter measure.

Breweries, Hotels, Boarding-Houses, Fountains, Gas-Works, Bakeries, Asheries, &c., one and a half cents per barrel, meter measure.

Livery Stables.—Each horse one dollar; each carriage one dollar per annum, or one and a half cents per barrel, at the option of the board.

Public Baths.—Each tub, five dollars per annum, or one and a half cents per barrel.

Gardens, without hose, special rates.

Building Purposes.—Each 1,000 brick, five cents; each perch of stone, one and a half cents; and each 100 yards of plastering, thirty cents.

The supply of water may be withheld from premises occupied by more than one family using water from the same hydrant, unless the owner of such premises pays the water-rates assessed thereon; and where more than one assessment is made for water used from the same hydrant, on the neglect or refusal of any one so assessed to pay the amount of their water-rate, the water will be shut off from such hydrant.

DANGER OF FIRES IN COAL-OIL REFINERIES.

Fire-Marshal Blackburn, of Philadelphia, in his annual report to the Mayor, thus refers to the dangerous nature of coal oil works:

"The frequent burning of coal oil refineries has induced underwriters to shun them as so many gunpowder magazines. Such is the constant liability of these places to accident by fire, their destruction is believed to be only a question of time. As they continually jeopardize surrounding properties, besides being a nuisance to any densely populated neighborhood in which they may be located, I would most respectfully suggest whether it would not be a measure of wise prudence on the part of our municipal legislators to prohibit them from being carried on in the thickly built portions of the city. It seems to me that some such action as this, at the hands of Councils, is demanded by a proper regard alike for the safety and health of the citizen.

"Petroleum, in its crude state, contains a highly volatile and inflammable material called benzine. This ethereal substance is separated by distillation, and its vapor, mingling with common air, forms an exceedingly explosive compound. Hence the refining process is always hazardous. The atmosphere of the refinery being charged with benzine gas, let combustion ensue from any cause, and the establishment can scarcely escape damage or demolishment; while the operatives who may chance to be near the stills, are fortunate if they are not killed by the explosion of gaseous matter, or disfigured for life by the flames.

"The production of coal oil in Pennsylvania has already become a business of vast extent, and its future magnitude as an element of the wealth of our singularly favored Commonwealth cannot be calculated. Philadelphia is the natural port for the outlet of this new article of commerce, and it is both her interest and duty to encourage and foster the trade. Yet, while inviting and sustaining the golden traffic, our city ought not to forget that this commodity, from its peculiar nature, is not entirely free from risks and dangers. Far be it from me to utter a word that might be construed as antagonistic to this recently discovered source of gain, so rich in its rewards for the labor and enterprise of the industrious and thrifty people of our State; still, I would fail in my duty as a faithful officer, did I not direct notice to the hazards of the business.

"Crude petroleum is very inflammable, and when stored in large quantities is, at all times, unsafe. In the event of fire from any cause, properties adjacent to a warehouse or other building containing it could scarcely escape falling a prey to the ravages of the conflagration it would create. Its storage, therefore, in my judgment, should not be permitted in compactly built localities. Provision might be made for warehousing it in isolated places in the suburbs, convenient to the railroads entering the city, and of easy communication with the commercial centre; and I respectfully recommend the adoption of some such measure as this.

"Refined coal oil, if properly distilled, is not inflammable, and, of course, comparatively safe; but as the cupidity of manufacturers has induced the throwing into the market of an immense amount of it in an impure state, I think its storage should also be subject to certain restrictions, similar to those which I have recommended in relation to the crude article.

"Kerosene is fast taking the place of camphene and other burning fluids, as a light. There is great confidence reposed in it from a prevalent belief that it is the safest of all the burning fluids, being generally considered exempt from the chances of explosion. This confidence would not be misplaced if the distillers of it would always extract the whole of the benzine, which is the explosive constituent, from the oil. As many of the manufacturers, tempted by the prospect of increased gains, do not do this, every consumer of the fluid runs a greater or less risk in its use, unless fortunate enough to secure the pure oil. It is likewise known that some of the distillers of burning fluid have been using in its manufacture, benzine, as a substitute for turpentine, the Southern blockade having caused the latter article to be high, while the former is cheap. Fluid thus adulterated is terribly explosive. In view of these frauds, which are criminal, and sometimes even murderous in their consequences, a sense of duty impels me to give timely warning to everybody to be cautions in their purchases of kerosene and burning fluid, and likewise to urge, with great deference, the passage by the Legislature of severe legal enactments against adulterations of these materials.

"Benzine has lately been the cause of at least a score of fires in this city. Its general substitution for turpentine in paints, varnishes, and other preparations, in various manufacturing and mechanical arts, its tendency to assume the gaseous form, and the carelessness that too frequently attends its employment, will most likely continue to add to the list of such mishaps. Underwriters are now fully aware of the increased risks to which it subjects every building wherein it is used."

FOREIGN NEWS.

RECENT ENGLISH PATENT.

A patent has been recently granted to Frederick Gye, of London, for "*Improvement in constructing gasometers and gasometer tanks.*"

This invention relates to improvements in constructing gasometers and gasometer tanks. In carrying it out, a gasometer tank is constructed in such a manner as to render available much of the central space of land now covered or occupied by the tank of the gasometer. The tank for a gasometer, according to this invention, is made double at the outer circumference to receive the water or fluid employed, the interior space being left free for use when roofed or closed in, air and gas-tight.

It is preferred to use the compartment in the centre of a tank, to act as a second or interior tank to receive another or smaller gasometer, though such space may be otherwise advantageously employed, and the central portion of the small tank may be similarly arranged to the outer one, in order to admit of such space being used. The interior or smaller gasometer is arranged to act in the interior tank independently of the larger or outer gasometer, which works in the ring formed, or outer tank. When thus employing the enclosed and roofed space in the interior of the tank of a gasometer to receive a smaller or inner gasometer, the space between the roof of the enclosed compartment is in communication with the open atmosphere by suitable pipes or passages, so that the space may be at all times occupied by air; or such space may be so arranged as to receive gas when the inner gasometer is discharging its contents; and the gas received into the central compartment may be discharged into the mains when the inner gasometer is being charged with gas.

Instead of placing a gasholder-tank on the surface or below the surface of the ground, a circular wall of brickwork, or a circular framework of iron, or other suitable material, is erected. This circular erection may be perforated with arched or other openings, of a height convenient to admit men or materials being carried through them. The breadth of this wall or erection is to be sufficient to admit of a double or ring-gasholder-tank being placed on its upper surface, the said tank being of sufficient width to admit of the working therein of a single or double—that is, a telescope gas-holder.

The space extending from one side of the interior tank to the other, is to be roofed over, so as to form a covered circular compartment, approached by the openings through the circular wall or structure below. The roof of this compartment may, if necessary, be conveniently supported by a central column, with radiating struts, umbrella-like, or by a series of columns, or otherwise.

Should the gas-holder outside and above require support, when exhausted of its gas, which is often the case, small studs may be placed in different parts of, and upon the roof below, so as to afford a general and divided support to the gas-holder when it has fallen to its lowest point.

If it should be wished to use a portion of the reclaimed space, for the purpose of storing gas—that is to construct another gas-holder thereon—the lower circular wall is built somewhat wider than before; in fact, sufficiently wide to admit of two ring-tanks being built upon its upper surface by placing a third circular side of a tank thereon. This third, or inmost ring, will, however, only be one-half the height of the other two; and, when the space between it and the next or middle concentric ring is filled with water, it will form a proper receptacle for the reception of a gas-holder equal to the depth of the inmost ring or equal to one-half the height of the outer gas-holder. The space (now reduced) contained within this inmost ring must also be roofed over. Their will still remain below and unoccupied, a covered space, available for the stowage of coals, coke, or for other material or for other use. The domes of the gas-holders and roofs may be so constructed as not to require any interior supports.

This invention is also applicable when constructing gasometers, the tanks of which are built below the level of the surrounding ground, and for which an excavation has been made; only, in that case, it will be necessary to descend by an inclined plane, or other means, in order to enter the enclosed space under the gasometer.

In order that the interior, or lower gas-holder shall work properly, it is necessary that the space between its exterior and the roof above it, shall be converted into the outer atmosphere, so that, as it falls when delivering its gas into the mains, the space above it shall be readily supplied with air, which air will be again expelled, as the gas-holder is filled with gas.

An objection might be raised, that by adopting the most advantageous form of this invention, that is the lifting out of the ground, and placing on a wall so great a superficial area of material, the action of the wind might be found inconvenient. In order to remedy this evil, and, at the same time, to effect what is considered to be a further improvement in the construction of gas-holders and tanks, the outer ring of the tank is constructed of a height equal, or nearly so, to the greatest height to which the outer gas-holder will rise, when completely filled with gas, and on the inside surface of this outer ring is placed either wheels, or the guide-rods necessary to the steady working of the holder. It would not be necessary to make this extended tank, that is the portion above the water-line, of continuous sheets or plates of metal; it may be made of a sort of skeleton or open work, only care must be taken that it be of sufficient continuity to shield the gas-holder from the violent action of the wind.

WILLIAMSBURGH, N. Y.—This company have purchased two and a half blocks of ground at the foot of North Twelfth street, where new works will be erected. The dimensions of the retort house will be 222 by 60 feet.

PETROLEUM vs. INSURANCE COMPANIES.—The Insurance Companies of London, England, have had their equanimity disturbed by the large arrivals of petroleum in that city, and are in a quandary respecting the means to be employed to protect themselves. The Lord Mayor has had his attention drawn to the subject by the companies, who assert the oil is highly dangerous in a crude state, which is very true: but they likewise assert that it is liable to spontaneous combustion, which is not true. The exportation of petroleum from this country to Europe is increasing in such a large ratio, that millions of gallons will soon find their way thither, and insurance companies in other cities will encounter the same dilemma which for a while, perplexed the companies of our principal American cities.

GRASS VALLEY, CAL.—An effort is being made to erect gas-works at this place, a company having been formed for the purpose. Gas-works are increasing in California in more rapid proportion than in any other of the new States, notwithstanding the high price charged to consumers.

DUTY OF PUMPING ENGINES.—The following apt definition of the "duty" of pumping engines is from the pen of Robert E. Roberts, Esq., Secretary of the Board of Water Commissioners of Detroit, Mich.:

The term "duty" is applied by engineers to a conventional measure of the economical working of an engine in regard to the consumption of fuel only. The cost of the machine to produce the result is not taken into account. An engine may be constructed, without regard to its cost, that will attain high duty, and still rank far below one of lower duty in its economic value. The interest on the first cost of engines, and necessary appendages to put them into operation—such as building, foundations, &c., and the cost of maintenance, repairs, &c.—must be taken into account, as well as fuel; all of the characteristics alluded to must work profitably together to entitle an engine to take high rank. The cost of power to supply water to cities, varies according to the degree of public ostentation and engineering skill applied to it.

The following table shows the cost for power, (engines, foundations, stand-pipes and buildings included,) the capacity and the cost per one thousand gallons capacity, of the water-works of recent construction, in the cities named:

CITIES.	Number of Engines.	Capacity to supply in 24 hours.	Cost of Power.	Cost of power per 1,000 galls. capacity.
		U.S.Stand. Gall.	Dolls.	Dolls. Cts.
Detroit, Mich.....	2	12,188,000	50,000	4 10
Hartford, Conn.....	1	2.180,000	40,000	18 35
Cleveland, O.....	2	7,500,000	154,000	20 53
Louisville, Ky.....	2	12,000,000	237,848	19 82
Hamilton, C. W.....	2	3,456,922	206,000	59 58
Chicago, Ill.....	2	19,221,120	131,081	6 82
Jersey City, N. J..	1	5,500,000	127,023	23 09

BROOKLYN, N. Y.—A regular weekly meeting of the Board of Aldermen was held on the evening of April 21st. In the absence of the President, Alderman O'Keefe was called upon to preside. At this meeting, the communication of the Board of Water Commissioners, recommending water-rates, was taken up for consideration. This matter was under discussion for nearly two hours and was finally adopted as presented, with the single exception of Section 11, under "special rates," the charge for "cart and other work horses," was amended so as to read "$1 each," instead of "$1 50 each," as recommended by the Commissioners. This was reduced because it was deemed unnecessarily high, and oppressive to the poorer classes. The general rates for dwellings are arranged upon a basis of three cents for each one hundred gallons of water used. Under "special rates," which includes business places where a large quantity of water is used, the basis of estimate is at two and a half cents per hundred gallons.

On vacant lots where distributing mains are laid, he assessment is as follows:

On lots of which the assessed value shall not exceed $1,000, ten cents per foot on the front width. That is, a vacant lot with a frontage of 25 feet, has to pay annual water tax of $2 50.

On lots where the assessed value is more than $1,000, and not exceeding $2,000, the tax is 15 cents per foot on the front width.

On all lots the assessed value of which is more than $2,000, the tax is 20 cents per foot on the front width.

For manufacturing purposes, steam, and ferry-boats, &c., the price of water is at the rate of 2 cents for each 100 gallons.

The principal opposition to the rates proposed originated from the assumed fact that under section 10, the Water Board proposed, at the same time, to supply every house with a meter to measure the water used, which if done, it was alleged, would involve an immense expense to somebody—each meter, it was stated, being valued at $20, and then, also, there would be extra expense for altering the meters; in this, some of the Aldermen saw a big job for somebody. The objectionable paragraph reads as follows: "The above rates are predicated upon supplying water at the rate of three cents per one hundred gallons." Alderman Strong moved to strike that out, but after a long discussion, the Board, by a very decided majority, refused to do so.

HARTFORD, CONN.—On Monday, April 21, a great freshet occurred in the Connecticut river—the result of the melting of the vast masses of snow and ice in the mountains of New Hampshire and Vermont, caused by several days of very warm weather, followed by heavy rains. A number of streets in the city of Hartford were submerged, and the city was in total darkness on the night of April 21st, the supply of gas having been wholly cut off by the prevailing flood.

PATENTS.

UNITED STATES.

34,880.—P. D. Cummins, of Portland, Maine, for a Kerosene Oil Burner:

I claim, first, So constructing a lamp for burning kerosene oil that its cone may be removed from over the top of the wick to a position at the side of the lamp, and thereafter be automatically returned to its position over the wick, substantially in the manner set forth.

Second, I claim the sheath, C, in combination with the rod, f, substantially in the manner and for the purpose specified.

Third, I claim removing the cone from its seat upon the lamp, first by a vertical movement and then by a lateral movement of the cone, for the purpose specified.

34,884.—William Fulton, of Elizabeth City, N. J., for Improved Fastener for Lamp Chimneys:

I claim the curved clasp or arms, C, as shown in Fig. 1 and Fig. 4, when attached to and formed of a belt or pin, as shown at B, in Fig. 1 and Fig. 4, and made adjustable, in relation to the chimney, through the instrumentality of a spring, screw, or lever, substantially in the manner and for the purpose set forth.

34,890.—Henry Knight, of Jersey City, N. J., for Improvement in Moulds for Cement Pipes:

I claim, first, The combination with a vertical flask, of the lower sliding collar, F, and a central core, substantially as and for the purpose set forth.

Second, The combination of the tubular core, tubular detachable collar, C, and a vertical flask in the manner and for the purpose described.

34,900.—Orrin Newton, of Pittsburgh, Pa., for Improved Holder for Lamp Chimneys:

I claim the use of a chimney holder, consisting of a circular piece of metal or other suitable material, separate and detached from the burner frame, and surrounding the base of the chimney, and having projecting arms or handles, constructed and operating substantially as described, for the double purpose of holding the chimney in place in the burner frame, and removing it therefrom, without the necessity of handling the chimney in so doing.

34,904.—Timothy Raymond, of Franklinville, N. Y., for Improvement in Lamps:

I claim the arrangement of the wick tube, C, with the movable side, a, spring, c, and screw, d, with the wicks, E and F, connected and used, as represented, whereby the wick, E, is regulated and supplied with oil, substantially as set forth.

34,908.—Oliver Snow, of West Meriden, Conn., for Improved Spring for Lamp Chimneys:

I claim the use of a coiled wire spring, in combination with the upper part of the lamp top, to secure the chimney in its place, when they are constructed, attached, and fitted, to produce the effect, substantially as described.

34,914.—S. H. Timmons, of Memphis, Tenn., for Improvement in Locomotive Lamps:

I claim adjusting the distance between the lens, g, and the reflector, C, so as to converge or diffuse the light, as may be desired, by means of the rod, o, or its equivalent, extending from the lamp to the caboose of the engine, within the immediate control of the engineer, substantially as described.

34,917.—Linn Van Order, of Ithaca, N. Y., for Improvement in Mica Lamp Chimneys:

I claim so constructing the frame work of the chimney as to inclose the edges of the mica on all sides, and making one end adjustable, so as to allow the ready and easy removal of the mica, for the purpose of cleaning the same, or renewing it when worn out, soiled or otherwise injured.

34,921.—E. E. Conrad (assignor to Henry Coulter), of Philadelphia, Pa., for Improvement in Holders for Lamp Shades:

I claim, first, The clamps, a a a a, for the purpose of holding the shade, as and for the purpose set forth and described.

Second, clamps, a a a a, in combination with the double braces, b b b b, and the wire rim, C, in the manner and for the purpose specified.

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PATENT-OFFICE NOTICES.

UNITED STATES PATENT-OFFICE,
WASHINGTON, April 17, 1862.

ON THE PETITION OF PHEBE Ann Fisk, Executrix, &c., of Almond D. Fisk, late of the City, County, and State of New York, praying for the extension of a Patent granted to the late Almond D. Fisk, Nov. 14, 1848, and re-issued March 6, 1860, for an improvement in Coffins, for seven years from the expiration of said Patent, which takes place on the 14th day of November, 1862.

It is ordered that the said petition be heard at the Patent-Office on Monday, the 27th of October next, at 12 o'clock m.; and all persons are notified to appear and show cause, if any they have, why said petition ought not to be granted.

Persons opposing the extension are required to file in the Patent-Office their objections specially set forth in writing at least twenty days before the day of hearing; all testimony filed by either party to be used at the said hearing must be taken and transmitted in accordance with the rules of the office, which will be furnished on application.

The testimony in the case will be closed on the 18th of October next; depositons and other papers relied upon as testimony, must be filed in the office on or before the morning of that day; the arguments, if any, within ten days thereafter.

Ordered, also, that this notice be published in the "National Republican," Washington, D. C., and "Tribune," New York, N. Y., once a week for three successive weeks; the first of said publications to be at least sixty days previous to the day of hearing.

D. P. HOLLOWAY,
Commissioner of Patents.

HARRIS LOUDERBACK, FIRE-BRICK LAYER
AND GAS RETORT SETTER,
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The second part is approaching completion and will shortly be announced.

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References by permission:
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AARON CLAFLIN, Esq., "
A. B. WOOD, "
GEORGE BLISS, Esq., N.Y., Pres. M.S & N.I.R.R.Co.
GEO. M. ATWATER, Esq., Springfield, Mass.
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WOODEN TRAYS FOR GAS-PURIFIERS.—The subscriber manufactures the WOODEN TRAYS for GAS-PURIFIERS on the invention of Wm. Combe, *cut from solid wood*, which are found superior to the iron plates formerly used, as being cheaper and more durable. The public are cautioned against the statements of R. G. Hunt, saying he has a patent for the seive itself, published in the AMERICAN GAS-LIGHT JOURNAL, as wholly without foundation. The following letter is from the Commissioner of Patents:

U. S. Patent Office, Jan. 6th, 1862.

Sir—In the matter of interference between the application of Hunt and Combe for patent conically slotted wooden gas-purifiers, appealed from the decision of the Examiner, the Examiners-in-Chief have rendered a decision, bearing date Jan. 4th, 1862. *The Examiners-in-Chief affirm the decision of the Examiner rejecting the first claim of Rich'd G. Hunt, and reverse the decision of the Examiner, rejecting the application of Wm. Combe, assigned to N. O. Hawxhurst.*

Unless an appeal shall be taken from this decision of the Examiners-in-Chief within the next ensuing thirty days, a patent will be allowed to N. O. Hawxhurst, assignee of Combe.

Respectfully, D. P. HOLLOWAY,
Com. of Patents.

All orders for Solid Wood Trays executed at the shortest notice, on reasonable terms, by
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CONICALLY SLOTTED SOLID Wood Trays for Gas-Purifiers.—Admitted to be the best, cheapest, and most durable seives for gas-purifiers ever used.

Secured by Letters Patent of the United States, both for the machinery used in the manufacture, and for the seive itself.

For sale on reasonable terms to Gas-Light Companies or Agents, on application, by letter, to the patentee,
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N. B.—All persons are warned against purchasing these seives of others who falsely pretend to have patents for them. Suits will be commenced immediately against all persons infringing my patents by using or making wooden sieves, but those who hereafter purchase from me can buy their seives cheap and will not be troubled by me on account of former purchases. R. G. H.

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D. PARRISH, JR., is prepared to furnish estimates for Gas or Water Works, and to erect them on the most improved principles. Office, 1416 Arch st., Philadelphia.
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Manufacturer of CLAY RETORTS, FIRE BRICKS, and every description of FIRE CLAY GOODS.

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Dealers in Tiles, Arch-Bricks, Furnace-Doors, MOUTH-PIECES, COVERS,
And all other Fittings, of the most approved patterns, for setting Clay Retorts.
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Manufacturer of all kinds of FIRE-BRICK, GAS-HOUSE TILES, to suit all the different plans in use. Clay Retorts and Dentists' Muffles. Orders filled at short notice

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as a very superior article.
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HUNTER, KELLER & CO., Manufacturers of
WROUGHT-IRON PIPES & FIXTURES,
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These Pipes have been in use nearly three years, and have given the most perfect satisfaction.

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WORTHINGTON'S STEAM PUMPS, extensively used by Gas-Light Companies. For Sale at greatly Reduced Prices.

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STERLING GAS-REGULATOR,

Improves the Light and Saves a Large Per Centage of Gas.

MANUFACTURED BY THE

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It is well known that Printers require the best and most brilliant light. In proof of the superiority of these Machines over all others, the following New York establishments are using them, and testify to their excellence:—New York Times, New York Herald, New York World, New York Tribune, New York Sun, Journal of Commerce, Courier & Enquirer, Evening Post, The Zietung, Dispatch, Leader, Scientific American, Advertiser and Spectator, Independent, Daily News, Harper's Monthly and Weekly, Transcript, Mercury, Atlas, Life Illustrated, Albion, Spirit of the Times, AMERICAN GAS-LIGHT JOURNAL, Christian Enquirer, Churchman, Church Journal, Christian Advocate, Christian Ambassador, Christian Intelligencer, Observer, Sunday Times, Sunday Courier.

By order of the New York and Brooklyn Common Councils, these Regulators are now used in the City Halls, Police Stations, Markets, and other Public Buildings in both cities.

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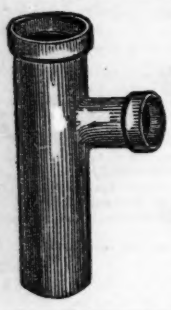
To keep in order, and always maintain the pressurs of the Gas at the lowest point for a brilliant light and economical combustion. They are so constructed that *under no circumstances can the Mercury get into the Meters, or in any way injure them.*



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PURE WATER & SOIL PIPE,

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Wortley Fire-Brick Works, Leeds, England.

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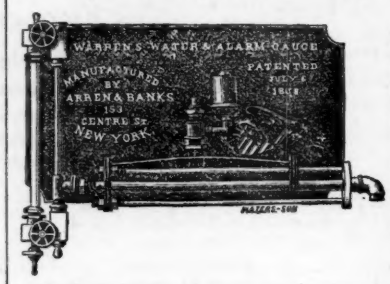
WARREN'S PATENT WATER & ALARM GAUGE

For Protecting the Flues and Preventing Steam-Boiler Explosions.



This is a reliable High and Low Water Detector, arranged so as to render it one of the best Water Gauges ever attached to a Steam-Boiler; always presenting before the Engineer at sight the exact height of the water, and if, by oversight or by sudden leakage, the water gets low in the boiler, it will cause an alarm before the water gets below the flues, thereby preventing an explosion. This Gauge can be made to alarm at any point desired as a High Water Detector, thereby preventing the water from getting to that height as to be forced into the cylinder of the engine, often causing serious accidents. Thus it is a High as well as a Low water Detector. For sale by

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Where a Gauge is constantly in operation.

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The original Manufacturers of WROUGHT-IRON GAS TUBES, and the Inventors of the Lap-welded Tubes for Locomotive and Marine Boilers. All kinds of TUBES and FITTINGS, whether for Gas, Steam, or Water. Galvanized and Composition Tubes. Chandeliers, and every kind of Brass work for Gas and Steam.

STOCKS, DIES, AND TAPS OF ALL SIZES. CAST-IRON PIPE AND GAS-METERS.

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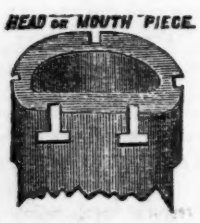

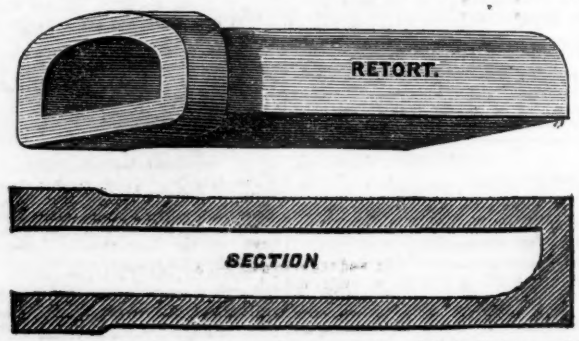

KING BROTHERS beg especially to call the attention of Gas Companies to the superiority of their Retorts, which are made from the celebrated STOURBRIDGE FIRE-CLAY. Mr. King has patented a Kiln for Burning Retorts, by which Patent all Cold Air is excluded from the Kiln while burning, thus rendering them

Free from Cracks and Correct in Form.

By great care in Manufacturing, combined with the advantages in Burning, a VERY SMOOTH SURFACE is obtained, rendering them less liable to carbonize.

RETORT OVENS, FIRE-BRICKS, GUARDS, SADDLES, RABITTED BURS, FLUES, AND QUARRIES, ARE ALL MANUFACTURED OF THE SAME QUALITY OF CLAY.

EVERY RETORT AND BRICK IS BRANDED "KING BROTHERS, STOURBRIDGE."

Apply to E. W. BARSTOW, 83 Maiden Lane, New York, where samples can be seen.

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Best Glass-House Pot & Crucible Clay.

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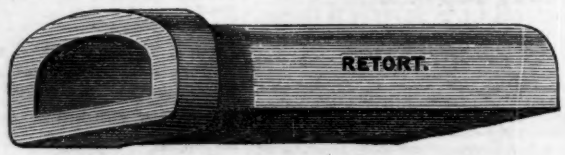
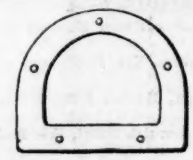
COWEN'S PATENT FIRE-CLAY RETORTS.





JOSEPH COWEN & CO.,

BLAYDON BURN, near Newcastle-on-Tyne, England,

Have always been, and are still, the most extensive manufacturers of FIRE-CLAY RETORTS in the United Kingdom, and were the only parties to whom a Prize Medal was awarded at the Great Exhibition, in London, 1851, for

"GAS RETORTS, AND OTHER OBJECTS IN FIRE-CLAY."

J. C. & CO. make Fire-Clay Retorts of all shapes and dimensions, and to fit existing mouth-pieces.

Orders for FIRE-CLAY RETORTS, TILES, BEARERS, and other articles in Fire-Clay, receive immediate attention, and are promptly executed at their Works, as above. Drawings of Settings adapted for Cowen's Patent Fire-Clay Retorts supplied.

AGENTS, MESSRS. MEAD & BELL,

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N. B.—J. C. & CO.'S RETORTS are well adapted for small Gas-Works, as they can be used without an Exhauster.

POTTS' REVOLVING SIGNAL LIGHTS,

PATENTED SEPTEMBER 8, 1857.

Mr. ALBERT POTTS, the well known Inventor of the LAMP-POST LETTER-BOXES, which have been adopted by the Post-Office Department for the large cities of the United States—and also of the GAS METER BOX, to be set in the front walls of houses, thus doing away with visits from Gas Inspectors, or burglars in gas-clothing, has lately brought forward a third Invention, which in point of importance and world-wide usefulness, surpasses the others entirely.

These SIGNAL LIGHTS are intended for use on Vessels propelled by Steam, and those exclusively. They specially indicate the presence of a Steamer, and by their use, there will be less likelihood of mistakes, and consequent collision than at present. They are also intended for SIGNALLING AT NIGHT, and can be used for that purpose UNDER ANY CODE of SIGNALS NOW ARRANGED FOR FLAGS.

This Improvement in Lights for Steam Vessels, consists in having the Lanterns containing the colored lights, connected by means of a series of cogged gearing with some convenient part of the Engine or Machinery, so as to cause them to have a revolving motion around their axis. On side wheel steamers, the Lanterns should be placed directly over the wheel-houses, and the power, or motion to turn them, may then be very conveniently obtained frem the paddle wheel shaft. On Propellers, the Lanterns should be placed on each side of the Pilot House, or hurricane deck, and the rotary motion derived from any convenient or suitable part of the Engine or Propeller Shaft. Each Lantern is supported on the end of movable cranes, so that their relative positions may be changed and properly adjusted to suit the view of observers on either side of the vessel at the time of signalling.

The Lanterns to be used in this improvement may be constructed for Burning Oils, Fluids, Gas, or any of the known modes of illumination, and should be furnished with one or more lenses and reflectors, so as to concentrate the rays of light, and project them over the horizon with the greatest intensity. The lenses for this purpose should be made with colored glass, viz., Red and Green, and the position of the respective Lanterns, according to the color of the lenses therein, must be placed on the sides of the vessel so as to answer to the requirements of Rules and Regulations made and published by the Supervising Inspectors of Steamboats, agreeably to the Act of Congress of the United States in such cases made and provided. That is to say—by said Regulation—the Lantern having the green lenses for producing the Green Colored Light, must be placed on the starboard side of the vessel, and the other Lantern producing the Red Light, to be placed on the port side thereof In pursuance, also, of the aforesaid Rules and Regulations, there is to be found in board and behind each Lantern, a screen to answer the purposes therein mentioned.

The cogged gearing, by which the Lanterns are connected with the Engine or paddle wheel shaft, and thereby caused to revolve when the Engine is in motion, is so arranged that the connection may be readily shipped or unshipped, and the lanterns made stationary or otherwise, at the pleasure of the Pilot, or those whose duty it may be to operate and attend to the same. The cranes on which the Lanterns are placed, are also rigged so as to be readily turned horizontally from one position to another, so as to present one or both lights to the view of observers when laying athwart ships at the time of signalling.

On the Use and Application of the Improvement for Night Signals.

When the vessel is under weigh, or going ahead in its course, the Lanterns are to be placed directly athwart ships, so that such colored light therein will then have the position and place prescribed by Rule Seventh of the aforesaid Supervising Inspectors of Steam Boats, and with the screens behind them, as above described, will then answer all the intents and purposes for which the colored lights are thus required to be used, as illustrated in the several diagrams published by said Inspectors for the working of a system of Colored Lights. The Lights in this case, according to the color seen by the observer, indicate the course or direction of the vessel whereon they are carried. When the Lanterns with the colored lights therein, are made to revolve around on their axis, as proposed in this improvement, in addition to the signal above, another and as we believe, very important and useful signal is thus formed, indicating that the vessel, whereon it is carried is a Steamer. In dark foggy nights, it is found by experience, to be somewhat of a difficult task to distinguish sailing vessels from Steamers and Propellers, especially when the latter are rigged, and carry a press of sail. When Steamers meet "head and head," it is the duty of each to pass to the right, or, on the larboard side of the other. Whereas, when a Steamer meets a sailing vessel, the former must give way and allow the latter to pursue its course. Hence, to carry out the regulations of the said Steamboat Inspectors, and prevent collisions, it is important to have some infallible sign, whereby the character of the vessel may be readily seen and determined. Several very fatal collisions have recently taken place through mistakes of this kind.

On Signals for Speed and Distance.

The gearing of the Lanterns with the paddle wheel or propeller shaft, may be so arranged as to be an index of their speed A very good proportion, would probably be to make the Laterns turn about one third as fast as said shaft. Hence, when the speed of the vessel is previously known, when making a certain number of revolutions of the paddle or propeller, it becomes an easy task from observing the time with which the Lanterns thereon may be turning to approximate to the speed with which the said vessel is moving at the time of observation. Again, as the arcs described by the rays of light from each lantern, as they revolve around on their axis, is greater in proportion to the distance from said lantern, so will the time in which said rays move over any given space, be less in the same proportion. Hence, when the lights are very remote, or far off, from the observer, the duration of each column or cylinder, of rays from each lense, would pass the eye of the observer, in a short space of time, or with great velocity. Whereas, at a nearer point of observation, the time of its passage would be considerably lengthened, or the motion thereof apparently much slower. From these facts, we believe the improvement is susceptible of indicating, in an approximate manner, the speed and distance of vessels whereon the revolving lights may be used.

On the Application of the Improvement for Marine Telegraphic Purposes.

The Revolving Lights can be readily applied to the general purposes of Marine Signalling at night, as follows: In order to show this application, we have adopted the Numbers as given in Roger's Code of Marine Day Signals, believing that work to be somewhat of a standard in matters of this kind. Instead of the flags used in the above code, for day signals, to indicate the combinations of two or more letters of the Alphabet, which combination is referable to certain numbers indicative of the words or sentences telegraphed, we propose to perform the same operation, at night, by means of the two revolving colored lights, so as to indicate the numbers directly to which the intended words or sentences to be telegraphed are referable. Thus, whether the vessel to be signalled is ahead, astern, or abaft the beam, the position of the two colored lights must be so adjusted, by means of the moveable cranes, whereon said lanterns or lights are fixed, that the two lights may be fully made visible to the observer. When both lights are thrown into this position, stopping the motion of the lanterns may be the signal for calling attention, or a rocket fired off, or the steam whistle blown, would answer the same purpose. Now, in order to represent the ten numerals, we propose to indicate them by the respective motions of the two colored lights, as follows:

RED LIGHT.	GREEN LIGHT.
One Red, Represents Number 1.	Two Green, Represents Number 2.
Three do. do. do. 3.	Four do. do. do. 4.
Five do. do. do. 5.	Six do. do do. 6.
Seven do. do. do. 7.	Eight do. do. do. 8.
Nine do. do. do. 9.	One do. do. do. 0.

In the above arrangement, it will be seen that all the odd numbers are made by the Red Light, and the even numbers by the Green Light. In order to indicate the repeat of the last number, once or more times, or for other special purposes, which may hereafter be found useful and necessary, an even number of lights may be shown by the Red, and an odd number by the Green. It will be understood that when the Lanterns are made with three lenses in them, the numerals as above arranged are formed by the number of times a new light or lense is presented to the observer. Thus to indicate the number 3, the Red Light or Lantern would make one entire revolution; and to make the number 6, the Lantern carrying the Green Light would make two revolutions, and so on with the other numbers. When a symbol is made, the motion of the Lantern is to be suspended for a short time, and when a number expressing a sentence is formed, the lantern may be stopped for a longer period, or some one of the special signals above referred to, may be used for this purpose.

To show the application of this improvement as above mentioned, whereby these Lights can be used as readily for Night Signals, as Flags are used for Day Signals by the author of Roger's Code, we shall use the sign O. colored red or green, according to the light used, to show the number of movements performed by the respective lights in order to represent any desired number of said code, suitable for the required purpose.

RED LIGHT.	GREEN LIGHT.
O, O, O, O, O,	
O, O, O, O, O, O, O.	
	O, O.
	O, O.

The above would represent the number 5722, and by reference to said Roger's Code, would be found to stand before the sentence:

"WILL YOU SHOW THE NUMBER THAT REPRESENTS YOUR NAME?"

RED LIGHT.	GREEN LIGHT.
O.	
O, O, O, O, O.	
O, O, O, O, O, O, O.	
	O, O.

Here the number expressed is 1572, and per the same Code, stands for

"WHERE ARE YOU BOUND?"

RED LIGHT.	GREEN LIGHT.
O.	
O, O, O, O, O, O, O, O, O.	
	O, O.
	O, O, O, O, O, O, O, O.

The number thus expressed is 1928, and per said Code is

"WHAT IS YOUR CARGO?"

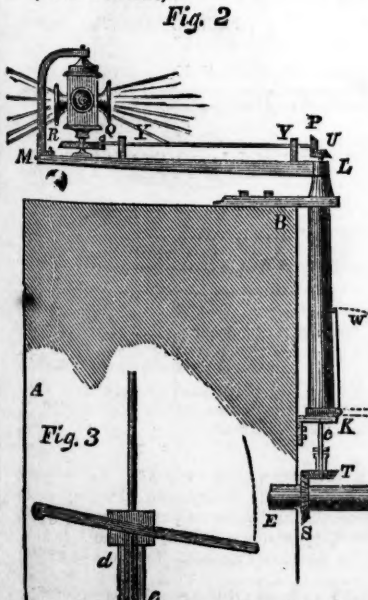
RED LIGHT.	GREEN LIGHT.
O, O, O, O, O.	
	O, O, O, O, O, O.
	O.
O, O, O.	

Here the number expressed is 5603, and stands for

"HAVE YOU ANY NEWS?"

(RED LIGHT.)

Fig. 2



(GREEN LIGHT)

Fig. 1

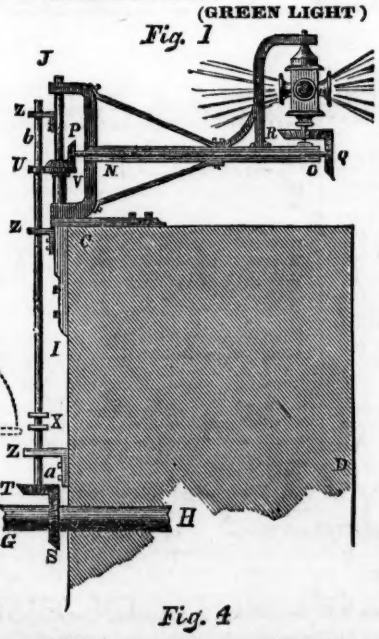


Fig. 3

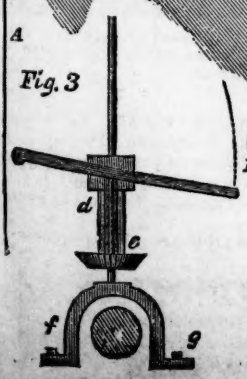


Fig. 4

MECHANICAL CONSTRUCTION.

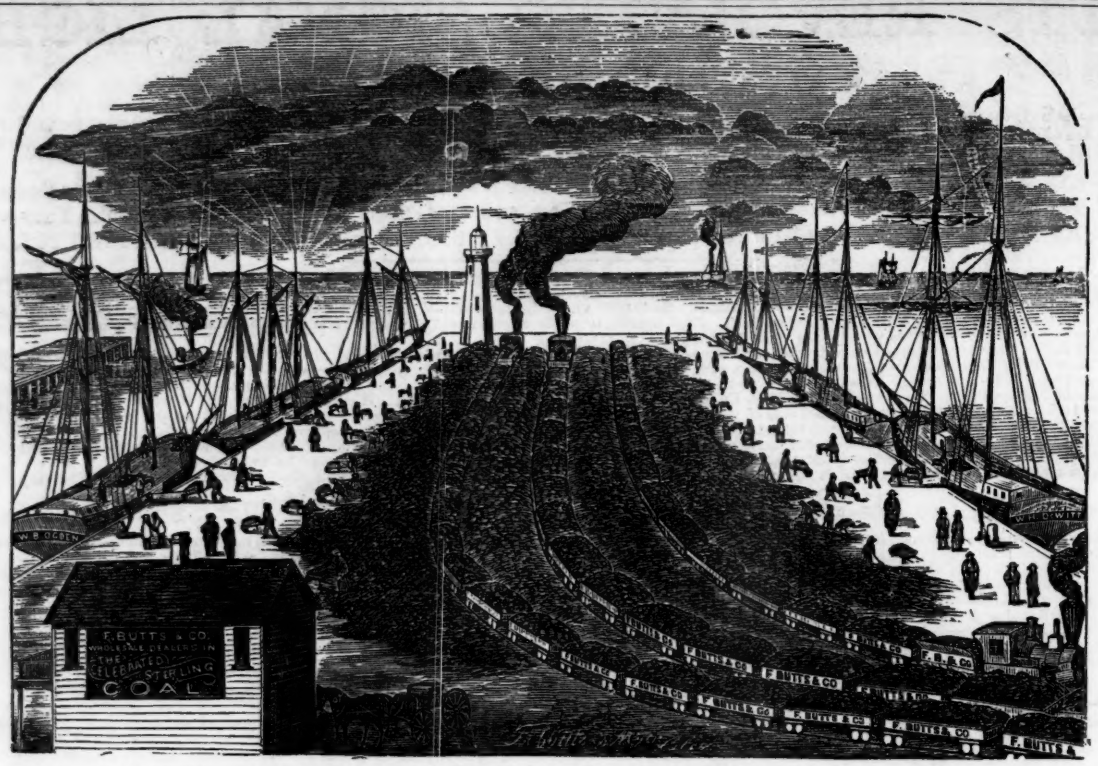
In our engravings, Figs. 1 and 2, represent Vertical Sections through the wheel-house. In them E F and G H represent portions of the main Shaft. In Fig. 1, I J is a stout Iron or Wooden post, fastened against the side of the wheel-house, directly over the main shaft. On the upper part of this post, is fitted the moveable arm or crane N O, to the main shaft is fitted the bevel wheel S, and to the lower end of the rod a b, is fitted a corresponding wheel T. U is a small pinion on a b, which gears with the spur wheel, V, which in turns gives motion to the wheels, P and Q, and so revolves the lamp R. It will be seen that a Rotary motion is given to the lamp, when the main shaft is in motion and a b connected.

It can be disconnected by a lever, acting between the bosses X, which will elevate the rod in the guides Z Z Z.

Fig. 2 is another arrangement, for the same purpose. In this, K L, represent a hollow Shaft, on which is firmly fastened, the arm L M, on which is the lantern. The hollow post is secured to the wheel-house by the straps K and B, and it can turn freely in them, the other part being the same in them as in fig. 1

The lever K W, when drawn down, will turn the frame in any required position around the Shaft c U. In fig. 1, the arm or crane N O, may be operated by cords from the wheel-house, but in this device, the rod c U, does not lift up as in fig. 1, but in its place, the lower end is made square, and on it slides the short tube, d E, shown in fig. 3. The lower end of the rod turns on a bridge, f g, spanning the main shaft. On the upper end of the tube, d e, a lever is attached by means of boxes and collars as shown in fig. 4. This lever when raised carries with it the beveled wheel T, thus disconnecting the gearing apparatus.

ALBERT POTTS, Patentee,
PHILADELPHIA, Pa.



(View of F. Butts & Co.'s Coal Pier, Cleveland, O., on the Government and Cleveland & Pittsburgh R.R. Piers at the mouth of the Cuyahoga River, Lake Erie.)

F. BUTTS & CO.,

(Successors to BUTTS & KENDALL,)

DEALERS IN THE CELEBRATED

STERLING COAL!

PITTSBURGH, AND OTHER GAS COALS,

CLEVELAND, OHIO.

DEAR SIR:—We beg leave to call your attention to the following, from which, and others, (and the universal expression of Gas men, as to the superior quality of Sterling Coal,) we believe that it is the best Gas Coal in the country.

From the MANHATTAN GAS LIGHT CO., New York.

Gentlemen:—Yours of the 9th inst. is received. The "Sterling Coal" received from you during the past year worked very satisfactorily—averaging 9,520 cubic feet of 15 candle Gas per ton of 2,240 lbs., and 41 bushels of Coke weighing 1,465 lbs.

We consider it among the best of American Gas Coals, for the quantity and quality of the Gas produced, and also for the excellent quality of its Coke.

I am Gentlemen, Your Obedient Servant, CHARLES ROOME, President.

From the OGDENSBURGH GAS CO., Ogdensburgh, N. Y.

January 6, 1862.

Messrs. F. Butts & Co.—This Company has used your Sterling Coal since July, 1860. We consider it the best Coal we have ever used; gives us larger yields of Gas, requires less lime, and makes a superior Coke. Respectfully, Yours, R. E. GORDON, Sup't Og. Gas Works.

From the RONDOUT AND KINGSTON GAS LIGHT CO., Rondout, N. Y.

January 10, 1860.

Messrs. F. Butts & Co.—Gentlemen:—This Company have used your Coal nearly two years. It is in every respect satisfactory, and to it is given the preference over all other coals. Its average yield is 4 40.100. The light clear and strong. The Gas is easily purified and quite free from sulphur. The yield of Coke is large and of superior quality. It is, in my opinion, equal to any Gas Coal in the market. Very Respectfully, WM. W. HAGUE, Sup't.

From the SANDUSKY GAS CO., Sandusky, O.

January 6, 1862.

Messrs. F. Butts & Co., Cleveland.—Gentlemen:—We have used your Sterling Coal for two years and six months past, and find it superior in quality and all that a number one Gas Coal can be. The illuminating power of the Gas is high, the Coke is of a superior quality, and in many instances our monthly average product has been 4 40.100 per one lb. Coal. It gives us entire satisfaction. I am, Gentlemen, Yours, Respectfully, WILLIAM HUDSON, Sup't and Sec'y.

From the TOLEDO GAS LIGHT CO., Toledo, O.

Gents:—Your favor of the 28th inst. to hand and noted.

The Sterling Coal received from Messrs. Butts & Co., the last summer and fall, fully sustains the character it has as a Gas Coal, from previous use in our works. We think the quality of Gas is very good, a little better than that produced from the Coal had of them the year previous—yielding 8,666 feet per ton of 2,000 lbs., and 36 bushels of Coke of very good quality, well adapted to our use.

Respectfully, Yours, GEO. SPENCER, President.

From the BUFFALO GAS LIGHT CO., Buffalo, N. Y.

Messrs. F. Butts & Co.—The Sterling Coal we have had from you we find to be an excellent Gas Coal. The yield of both Gas and Coke is good. The illuminating power of the Gas is high and the quality of the Coke is very good. ROBERT ROBSON, Foreman Gas Works.

From the CLEVELAND GAS LIGHT & COKE CO., Cleveland, O.

Gentlemen:—This Company has used between 3,000 and 4,000 tons of your "Sterling Coal," and are still using it with very satisfactory results. We find the average product of a ton of 2,000 lbs. is about 8,800 feet of Gas, and about 37 bushels of Coke. The Gas is of good illuminating power and quite free from sulphur or other impurities, one bushel of lime purifying 9,000 feet, and the Coke of vesy superior quality.

The yield of Gas is about the same as from the Pittsburgh Coal, and the Coke is better adapted to our use. Yours, Truly.

T. DWIGHT EELLS, Secretary.

From the ALBANY GAS LIGHT CO. Albany, N. Y.

Messrs. F. Butts & Co.—Gentlemen:—We have been using your "Sterling Coal" at these works for two years, finding it all that is important in Gas-making Coal, as respect yield and quality of Gas, and freedom from sulphur—as much so as any of the Coaking Coal in use. We are disposed to contract for a further supply of the same quality.

Very Respectfully, PAUL A. SABBATON, Sup't.

From the TROY GAS LIGHT CO., Troy, N. Y.

Messrs. F. Butts & Co.—Gentlemen:—The Coal we have used for the past year at our works has been mostly "Sterling." It has given us full satisfaction in every respect.

S. S. DAUCHY, Sup't.

The following analysis of "Sterling Coal" was made by Prof. J. LANG CASSELS, Professor in the Cleveland Medical College, who stands at the head of his profession as a chemist, and any statement made by him can be relied upon with safety.

Sp. gr.	1,288
Eygremaeric Moisture	1.85
Volative Combustible Matters	34.15
Coke (clear and porous)	64.00
	100
Fixed Carbon in the Coke	62.00
Ashes (yellowish white)	2.00
	64.00

COMPOSITION OF ASHES.

Silex	0.80
Alumini	0.45
Sulphate of Iron	0.75
	2.00
Per centage of Sulphur	0.23

J. LANG CASSELS, M. D.,
Prof. of Chemistry, Clev. Med. Col.

P. S.—The specimen from which the above analysis was made was taken by myself from a car load, and may be regarded as a fair average; in fact, this coal is very uniform in its characteristics. It also yielded 4 per cent. more gas than the Pittsburgh Coal. J. L. C.

We would also refer to Gas Companies in the following places:

NEW YORK CITY (Manhattan and New York Co.'s), BROOKLYN, ALBANY, TROY, WEST TROY, ROCHESTER, OSWEGO, OGDENSBURGH, LANSINGBURGH, NEWBURGH, ROME, PALMYRA, GENEVA, YONKERS, RONDOUT, KINGSTON, ALBION, BROCKPORT, SENECA FALLS, ELMIRA and LYONS, in State of New York; CLEVELAND, TOLEDO, SANDUSKY, NORWALK, OBERLIN, SALEM and FREMONT, in Ohio; DETROIT, ANN ARBOR, GRAND RAPIDS, KALAMAZOO, JACKSON and ADRIAN, in Michigan; COBURG, in Canada; CHICAGO, Ill., and two Companies in MILWAUKEE, Wisconsin.

STERLING COAL MINES, situated in Pennsylvania, are wholly under our control; the coal mined and sold only by us or our agents. (Agents in every instance having authority over our signature.)

Five years experience in Mining, Sale and use of Sterling Coal, gives us full confidence in asserting there is no Coal that combines all the requisites so largely for a Gas or Smithing Coal as this.

This year we are several hundred yards further in the Mine than last season, and feel assured Sterling Coal will more than sustain the high reputation it has heretofore gained.

Our facilities largely increased for MINING AND SHIPPING, we are prepared to supply the great demand for this Coal on a much more extensive scale.

Not being dependent upon high water for transportation, but receiving our Coal by RAIL, we are at all times prepared to fill orders, and ready to contract for delivery of the Celebrated Sterling Coal, on board Vessel or Cars at Cleveland, or at works of Gas Light Co's, in any of the Northern States or Canada.

CLEVELAND, *January* 15, 1862. Address— **F. BUTTS & CO., Drawer 74, Cleveland, O.**